ROAD AND STREETS

HIGHWAYS BRIDGES
AIRFIELDS
HEAVY CONSTRUCTION

FEBRUARY 1954

Gillette Publishing Co., 22 W. Maple St., Chicago, Ill.
Form 3547 Requested

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UNIVERSITY MICROFILMS
EUGENE B. POWER R6
313 N. 1ST ST.
ANN ARBOR, MICH.
COMP-LRY-11-50

CARBIDE INSERT? or MULTI-USE?
LOCATION: Route 128, Essex-Manchester-Gloucester, Mass.
OPERATING CONDITIONS: Drilling hard, abrasive granite.

TIMKEN® carbide insert bits give extra footage in hard, abrasive granite for Gil Wyner Company, Inc.

In excavating 375,000 cubic yards of extremely hard and abrasive granite for Massachusetts Route 128, Gil Wyner Company, Inc. gained extra footage with Timken® carbide insert bits!

Timken carbide insert bits are most economical for highest speed through hard and abrasive ground. They're also best for constant-gage holes, small diameter blast holes and very deep holes.

When it comes to ordinary ground, however, Timken multi-use bits are the most economical. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

With *both* Timken carbide insert and multi-use bits, you can solve your drilling problems. Both are interchangeable in each thread series. Many different Timken bits fit the same threaded drill steel. You can switch bits quickly and easily as the ground changes—right on the job!

Both Timken carbide insert and multi-use bits are made from electric furnace Timken fine alloy steel, have special shoulder unions that protect threads from drilling impact.

Let our Rock Bit Engineering Service help you select the best bit for your job—whether carbide insert, multi-use or both. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Timken threaded multi-use rock bit

Timken threaded carbide insert rock bit

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit ... for every job

Your P&H dealer has it!

NOW...
at the industry's lowest price!

Step out in front with
MITI-MITE

Here's why more and more users are buying MITI-MITE — for new ideas — money-saving performance — proved design.

Tops in Quality Construction

It's the simplest, most rugged, most dependable little truck crane ever built — with all the honest-to-goodness quality the P&H name implies! It's easier to operate. And by far the easiest machine of its kind to maintain.

Lowest Price

No other small truck crane gives you so much for so little money. It's loaded with modern features as standard equipment — not extras at additional cost.

Greater Earning Power

For 101 jobs all over the map! P&H's greater stability lets you put "more on the hook" — work faster on any kind of job with less danger of tipping. Greater work capacity means more earning power — more money in your pockets.

It will pay you to buy **now.** Place your order today!

P&H

MITI-MITE

(Model 55)

Fully convertible. 11 cu. ft. capacity as hoe, shovel, etc. 7 tons as a crane. It's a terrific buy!

P&H TRUCK CRANES

HARNISCHFEGER

CORPORATION

Milwaukee 46, Wisconsin

the P&H *Line*

See your P&H dealer NOW!

"Your P&H Dealer has the experience, the organization and the facilities to serve you reliably in every way. He's ready to deliver the kind of on-the-ground service that keeps your jobs moving on schedule. Your P&H dealer is tops in the business. Get to know him."

General view of project during paving operations. One section of new interchange crosses bridge (upper right) and proceeds along embankment in background.

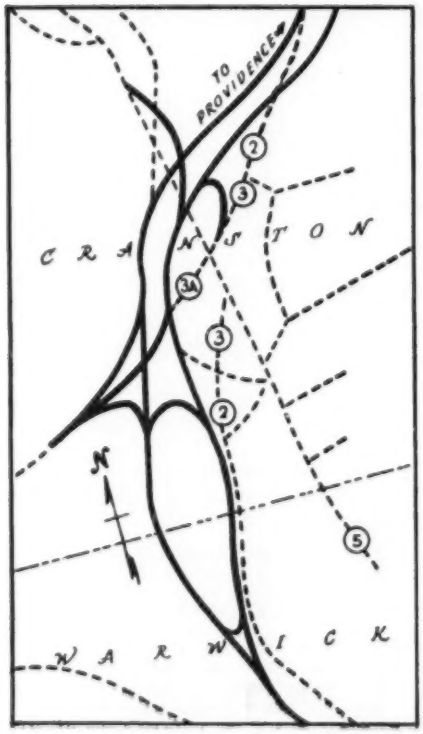
Jack Ramos (second from left), general superintendent for M. A. Gammino Construction Co., with (left to right) Sidney M. Budlong, Albert Capaldi and Carl Parker, state highway inspectors.

New Interchange Makes Things Easier for Bewildered Motorists

Until recently, the Cranston-Warwick area of Rhode Island, southwest of Providence, was no place for the timid motorist, or the bewildered stranger. For in that locality Routes 2, 3, 3A and 5 converged, the result often being a horn-tooting, temper-fraying bottleneck.

The aggravating condition has now been eliminated by the construction of the Meshanticut Interchange, a 1.48-mile double-barreled ribbon of concrete planned by the Rhode Island Dept. of Public Works, Division of Roads & Bridges. The newly opened highway, complete with sweeping turns, connecting lanes, bridges, culverts and service roads, keeps cars on the move, and cuts minutes from any trip through the area.

M. A. Gammino Construction Co., Providence, were the contractors for this important highway-improvement project. The engineers were Charles A. Maguire & Associates, also of Providence. Bethlehem furnished dowel units, fabricated steel and reinforcing bars.



Heavy lines show sweep of Meshanticut Interchange, in Cranston and Warwick, R. I. The new road eliminates congestion near where Routes 2, 3, 3A and 5 converge.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

PRODUCTS FOR HIGHWAYS INCLUDE

Dowel Units • Reinforcing Bars • Guard Rail
Guard Rail Posts • Spikes • Wire Rope and Strand
Hollow Drill Steel • Bolts and Nuts • Tie-Rods
Timber Bridge Hardware • Pipe • Sheet- and H-Piling

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ROADS AND STREETS

Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 62 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892.

FEBRUARY, 1954 • VOL. 97 • No. 2

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In This Issue

		PAGE
IN THE NEWS	$44,700,000 Budget for Cook County	45
	Turnpike Spur OKayed in Pennsylvania	45
	Hubbard and Waters Honored by Research Board	46
EDITORIALS	Horse and Buggy Specifications	47
	Construction and Good Times	47
MEETING NOTES	ARBA Speakers Urge More Federal Aid	60
FEATURES	Contractors at Work	50
	Meetings Ahead	58
	Views and Comments—*By H. G. Nevitt*	80
	Job and Equipment Ideas	108
	Technical Digest—*By John C. Black*	110
BITUMINOUS ROADS AND STREETS		69-100
ARTICLES	Oregon Pioneers Nation's Longest Toll-less Freeway	48
	Dragline Tracks Reworked with Welding	62
	Simple Tests Against Asphalt Contamination	75
	Heater-Planer Used in Resurfacing Settled Areas	76
	Wire Mesh in Texas Overlay	78
	Adaptation of Semi-Automatic Welder to Magnetic Flux —*By R. A. Hand*	83
	How to Design a Pre-Tensioned Bonded Prestressed Concrete Beam —*By Col. V. J. Brown*	101
	Remember These Old Timers?	106
	Our First Need: Better Administrative Laws—*By Louis R. Morony*	115
EQUIPMENT	What's New in Equipment and Materials	84
	Manufacturers' Literature	131
MANUFACTURERS	News from Equipment Manufacturers	119
CLEARING HOUSE		121

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Chicago Office: 22 W. Maple St.
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SURE-GRIP — top choice for traction.

ALL-WEATHER for maximum flotation.

Sure-Grip, All-Weather—T. M.'s
The Goodyear Tire & Rubber Company, Akron, Ohio

IN THE HEART OF THE GREAT SMOKIES, between Black Mountain and Old Fort, two new 22-foot pavements with 4-foot center strip and 10-foot shoulders, have at last replaced a dangerous bottleneck.

The contract called for blasting and slicing record cuts through mountaintops—and phenomenal fills—but the W. E. Graham Construction Company of Cleveland, N. C., moved 3½-million cubic yards in less than three-quarters of the time estimated!

Not bad for a job that included an 880,000 cubic-yard fill, a 440,000 cubic-yard cut, up to 350-foot differences between fill bottoms and pregraded knolls (all within 450 feet of roadway)—and a 173-foot-deep fill over a 66" x 576' culvert!

IT's jobs like these that make contractors glad that "GOODYEAR IS THERE"—all there—with rugged, strong-pulling, long-enduring tires—specifically designed to do the best, most economical job on each piece of equipment.

That's why you'll find Goodyears "there" on so many tough jobs—*specified* by the men who keep those tough jobs rolling at lowest tire-cost per yard! Goodyear, Truck Tire Dept., Akron 16, Ohio.

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE!

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

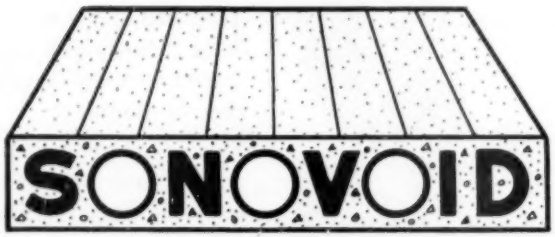
REDUCE WEIGHT of CONCRETE SLABS

Save CONCRETE!
Save STEEL!

ABOVE—Reinforced concrete roof slab construction. Note SONOVOID tubes in place to form voids.

by using

Voids formed with SONOVOID in reinforced concrete floor, roof, wall and bridge deck slabs eliminate the low-working concrete at the neutral axis WITHOUT impairing structural strength. Widely used and approved by leading engineers, contractors and architects. SONOVOID is immediately available in sizes 2" to 36.9" O.D., up to 24' long or longer. Can be sawed to exact lengths on the job.



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Construction Products Division
LOS ANGELES, CAL. — HARTSVILLE, S. C. — MAIN PLANT — MONTCLAIR, N. J.
GARWOOD, N. J. — BRANTFORD, ONT. — AKRON, IND.

"How's the engine doing, Mr. Denti?"

We asked Mr. George J. Denti, Secretary-Treasurer of the Montuoro Contracting Corp., Bronx, N. Y., that question *twice* about the Cat* D13000 Engine in this Bucyrus-Erie crane with 65-foot boom and 1-yard bucket.

The first time was in June, 1952, when this picture was taken of the rig working on the Bronx River Parkway.

The second time we asked him was more than a year later — September, 1953.

Both times Mr. Denti's answer was the same: "We're *very* well pleased with its performance."

Again and again you'll hear similar reports from men like Mr. Denti who keeps a close check on costs and production. In rig after rig, Caterpillar power helps deliver *more* work at *lower* cost with less down time.

What's in it for you when you specify rugged yellow diesels for your machinery? Many advantages! For example, you get honest HP—the horsepower listed on the specification sheet is conservative, not the stepped-up rating of a stripped-down unit. You get steady production—day after day with a minimum of attention. What's more, you get low-cost production. These thrifty engines burn low-cost fuel without fouling. And if you need service, you get it fast — on the job — from your Caterpillar Dealer.

Next time you order replacement power or new machinery, specify Cat power. More than 150 manufacturers can supply these durable engines—in 12 sizes up to 500 HP — in their equipment. They're built for a long life of profitable production. Ask your dealer to *show* you proof!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

SPECIFY CAT POWER FOR HIGH-PROFIT PRODUCTION

We give truck axles a brutal

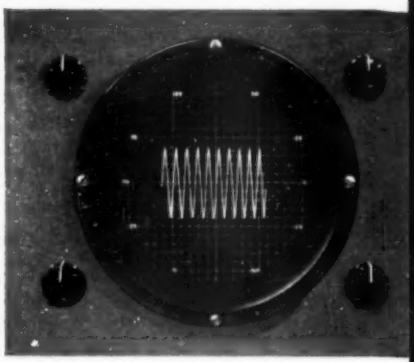
in the new Timken-Detroit indoor proving ground . . . and only

We torture them . . . shock-load, over-speed and jerk them . . . twist, strain and abuse them. We match every on-the-job hauling condition . . . then throw in a few devilish tricks of our own!

The result? You know for sure that *any* Timken-Detroit axle can take more abuse on the job it was built for than any other axle made!

To prove it, we moved a huge proving ground indoors. In one room we can simulate any hauling situation—our engineers can apply 50 years of experience to perfecting axles for modern trucks, buses and trailers, and measure performance with scientific precision.

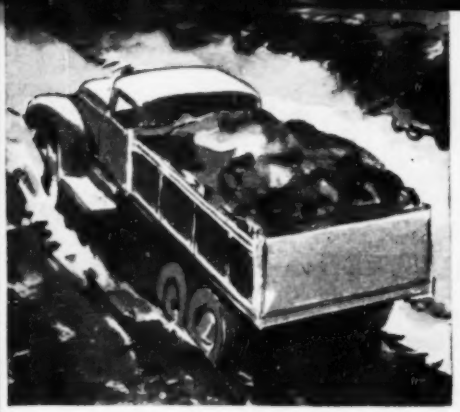
This research pays off in longer truck life; less maintenance, repairs and downtime; lower operating costs. No wonder Timken-Detroit axles with Hypoid gearing rate "first" with wise truck owners!



Whatever you haul . . . simulated service conditions show up electronically on a screen like this. For instance—a heavily loaded truck on a bumpy, twisting road—then on a level express highway or long grade. What happens to the axle and gearing is measured, charted with absolute scientific accuracy.

TDA controls quality in this "Torture Chamber"

Here we simulate actual highway conditions . . . test quality and performance of axles under any hauling situation, such as duplicating the kinetic energy of 80,000 lbs., G.C.W., at 60 m.p.h. All tests are repeated hour after hour with an automatic cycling control.



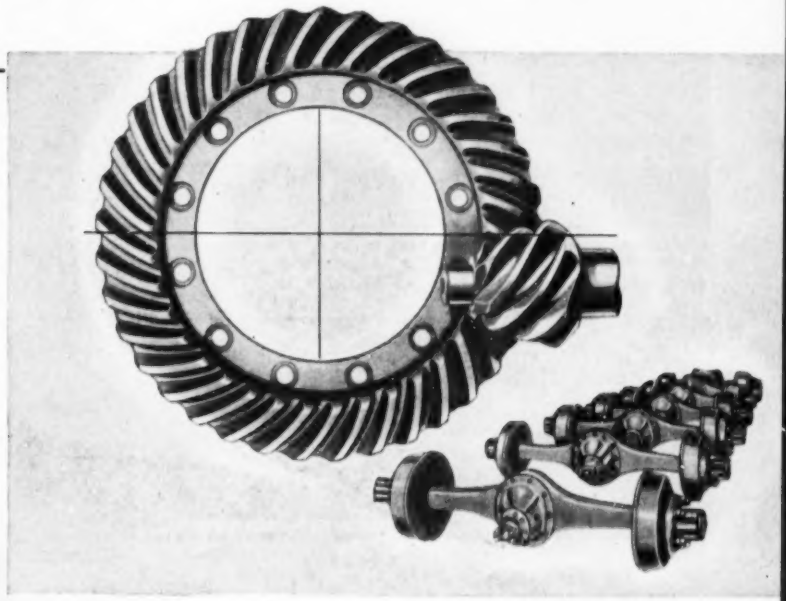
You're hauling gravel . . . you want truck axles with pulling power to get you out of the hole with a capacity load. You want steady, even power for long grades . . . speed on level road. You want all this at lowest r.p.m. *plus* easy, low-cost maintenance, economy of operation and little downtime. Timken-Detroit "Torture-Tested" axles are for you!

You're hauling wet concrete . . . you can't afford axles that "conk out" en-route. You want axles you know *for sure* will take off and get the mix to the job—*on time*—ready to pour. You don't want costly maintenance and repairs or shop-time. You want rugged Timken-Detroit "Torture-Tested" axles with Hypoid gearing. They save you money.

You're hauling dirt . . . you want axles that can get the load up and out of anywhere . . . then speed it to the dumping area and get back quick. You don't want to beat your engine to death . . . or have profit-eating maintenance, repairs or downtime. You want axles that can stand up—Timken-Detroit "Torture-Tested" axles with Hypoid gearing.

beating

Timken has it!



TIMKEN *Detroit* **AXLES**

TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
DETROIT 32, MICHIGAN

The Accepted D A *Standard*

TRADE MARK REGISTERED

"TORTURE-TESTED"
to Save Money on the Job

WORLD'S LARGEST MANUFACTURERS OF AXLES FOR TRUCKS, BUSES AND TRAILERS

Next truck you buy . . .
insist on Timken-Detroit Hypoid gearing

Hypoid gearing for truck axles was pioneered by Timken-Detroit.

Proved in billions of ton-miles of actual operation. Designed to give the slower gear ratios necessary for modern engines without loss of strength. Pinion is bigger, stronger . . . bearings are larger . . . more teeth in contact reducing loading per unit of contact area. Torque transmitting capacity increased to step up performance and rugged power.

Get interchangeability, too!

Only Timken-Detroit has Hypoid gearing in a complete "family" of 7 basic axle capacities—in the entire range of medium and heavy-duty requirements. This advanced-related design incorporates the same features of construction and interchangeability in single-speed; single-speed double-reduction; and two-speed double-reduction final drive units.

Plants at: Detroit, Michigan
Oshkosh, Wisconsin • Utica, New York • Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania

Stockpiles coal, sand, aggregate. Has traction and flotation to work right up on the pile.

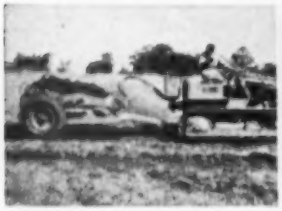
Excavates, fills, levels. Compact — for work in limited areas.

Backfills ditches, packs and levels ground with 16,200 lb. weight.

Cleans up rubble with one-cu. yd. tractor-width bucket.

Lifts material where needed. Saves manpower and need for other equipment.

Does sanitary fill work — digs, fills, covers, levels.



Does drawbar work scraping . . . hauling.

Landscapes, grades or slopes lawn areas around building projects.

ALLIS-CHALMERS HD-5G

Always Busy...

because it does so many jobs so well!

Busy equipment is profitable equipment. And thousands of owners are learning every day the year around that there's no more profitable machine on their jobs than the one-yard Allis-Chalmers HD-5G Tractor Shovel.

Loads sand, dirt, snow — any material to dumping height of 9 ft., ¼ in.

TEN QUICK-CHANGE ATTACHMENTS ADD TO HD-5G VERSATILITY

Bulldozer	Trench Hoe
Narrow Bucket	Lift Fork
Rock Bucket	Tine Fork
Crane Hook	Rock Fork
Light Material Bucket	Ripper

Larger size Allis-Chalmers tractors with shovels and other quick-change attachments offer the same wide utility, the same outstanding performing ability as the popular HD-5G. Choose the one that fits your needs.

1-YD. HD-5G	2-YD. HD-9G	3-YD. HD-15G	4-YD. HD-20G
40.26 drawbar hp.	72 drawbar hp.	109 drawbar hp.	175 net engine hp.
Dumping height*	Dumping height*	Dumping height*	Torque Converter Drive
9 ft., ¼ in.	11 ft., 4 in.	12 ft., 8 in.	Dumping height*
			13 ft., 5 in.

*Height of bucket hinge

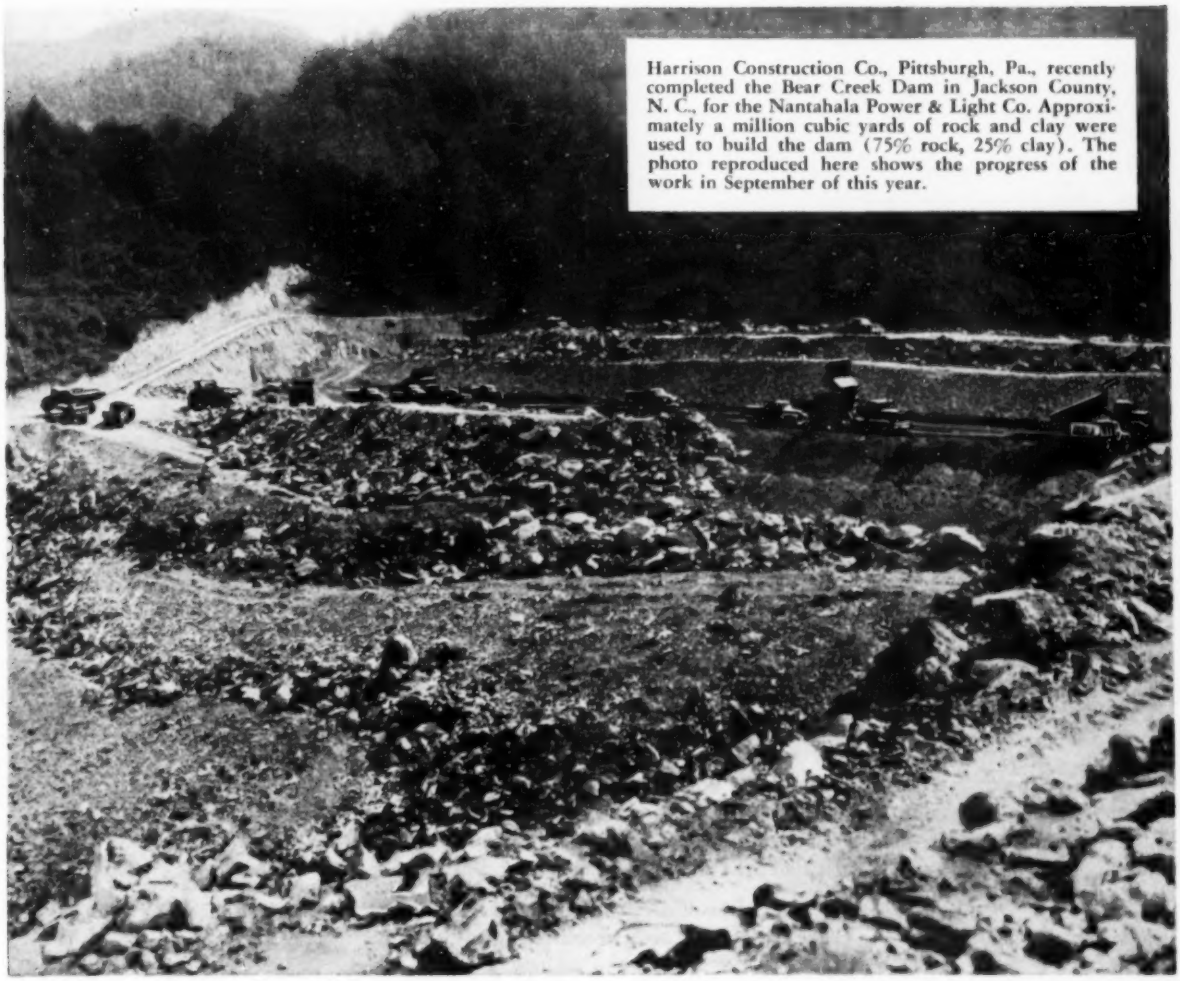
ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

GULF PRODUCTS *and* FINE SERVICE

keep equipment rolling

on North Carolina Dam Project



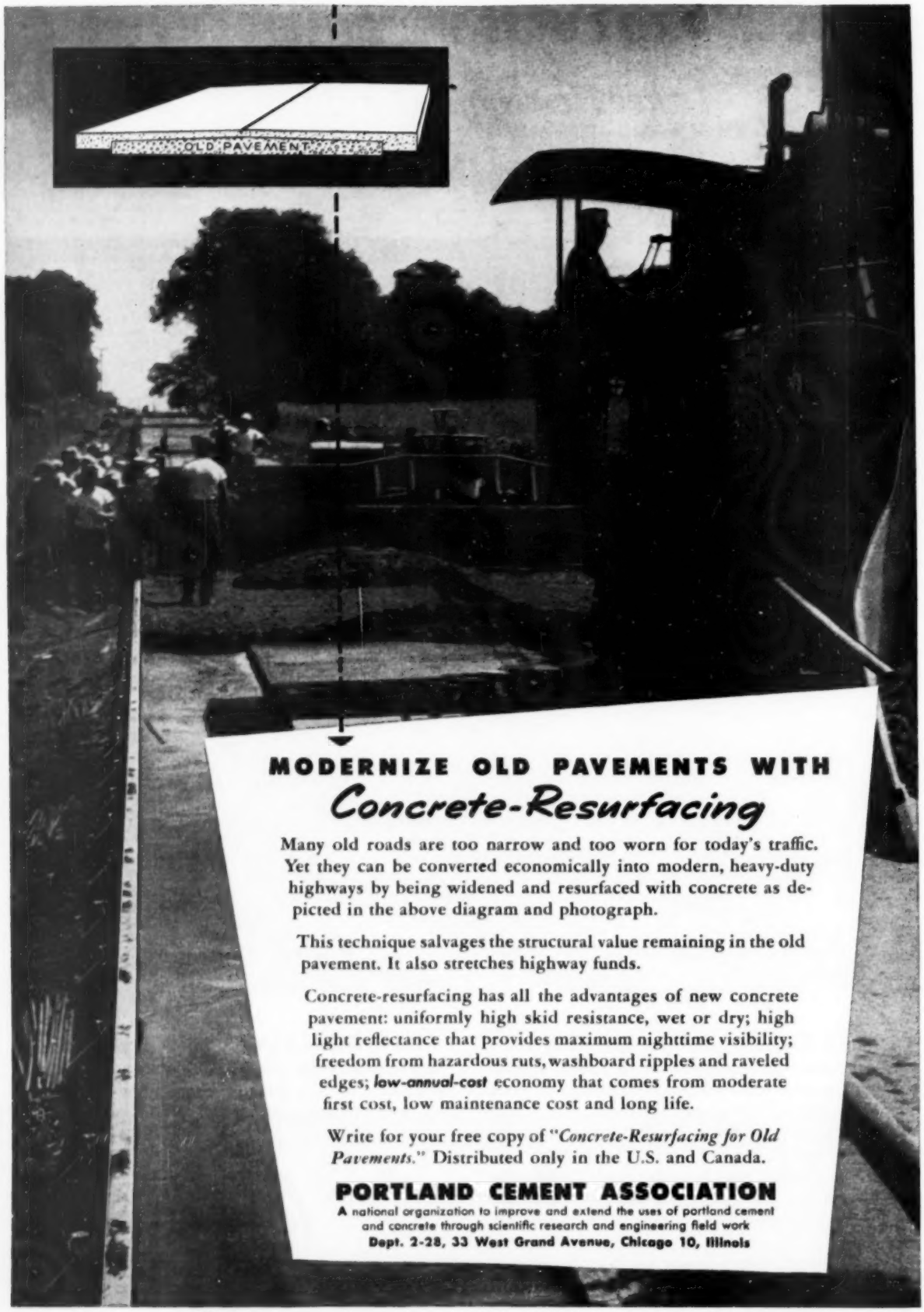
Harrison Construction Co., Pittsburgh, Pa., recently completed the Bear Creek Dam in Jackson County, N. C., for the Nantahala Power & Light Co. Approximately a million cubic yards of rock and clay were used to build the dam (75% rock, 25% clay). The photo reproduced here shows the progress of the work in September of this year.

WITH higher-than-ever operating costs threatening every dollar of profit, it will pay you to take stock of the advantages of Gulf Service and Gulf Petroleum Products.

Advantages like these, for example: Quality lubricants that provide an extra margin of protection for every gear and bearing; fuels that insure full power for every engine; expert petroleum engineering counsel; and prompt delivery service. You'll find, as have so many leading contractors, that they all add up to fewer mechanical delays, lower maintenance costs, and an all-round smoother operation.

Let us discuss with you how our products and services can help you on your next job. They are available to you through more than 1400 warehouses in 31 states from Maine to New Mexico.

GULF



MODERNIZE OLD PAVEMENTS WITH *Concrete-Resurfacing*

Many old roads are too narrow and too worn for today's traffic. Yet they can be converted economically into modern, heavy-duty highways by being widened and resurfaced with concrete as depicted in the above diagram and photograph.

This technique salvages the structural value remaining in the old pavement. It also stretches highway funds.

Concrete-resurfacing has all the advantages of new concrete pavement: uniformly high skid resistance, wet or dry; high light reflectance that provides maximum nighttime visibility; freedom from hazardous ruts, washboard ripples and raveled edges; ***low-annual-cost*** economy that comes from moderate first cost, low maintenance cost and long life.

Write for your free copy of "*Concrete-Resurfacing for Old Pavements.*" Distributed only in the U.S. and Canada.

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

Dept. 2-28, 33 West Grand Avenue, Chicago 10, Illinois

New Chevrolet Trucks for '54

Loaded with brand-new advantages you need and want!

You'll get more work done in less time and at lower cost with new '54 Chevrolet trucks on the job. They bring you more new features . . . more big new advantages than any other truck on the road.

For example, you get new engine power in all models. The advanced "Thriftmaster 235" engine combines bigger displacement and higher compression with other new features to give you greater power and finer performance. The rugged "Loadmaster 235" engine offers increased strength and stamina for heavier trucking operations. The all-new "Jobmaster 261" engine* brings you extra reserves of high-compression power for hauling big loads on schedule.

In addition, you enjoy new and even greater operating economy. All three 1954 Chevrolet truck engines bring you the full benefit of thrifty high-compression power.

And there are many, many more new things you'll like about these great new Chevrolet trucks. New, roomier pickup and stake bodies let you haul more . . . save you time and extra trips. And they're set lower to the ground for easier loading and unloading. New truck Hydra-Matic transmission* lets you drive all day without shifting. It's offered not only on ½- and ¾-ton Chevrolet trucks, but on 1-ton models, too. New Comfortmaster cab with one-piece curved windshield and amazing new Ride Control Seat* offers the last word in comfort, convenience and safety.

Plan now to see your Chevrolet dealer and get all the facts about the new Chevrolet trucks for '54. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Most trustworthy trucks on any job!

CHEVROLET

ADVANCE-DESIGN TRUCKS

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

THREE GREAT ENGINES—The new "Jobmaster 261" engine* for extra heavy hauling. The "Thriftmaster 235" or "Loadmaster 235" for light-, medium- and heavy-duty hauling. **NEW TRUCK HYDRA-MATIC TRANSMISSION***—offered on ½-, ¾- and 1-ton models. Heavy-Duty **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **DIAPHRAGM SPRING CLUTCH**—improved-action engagement. **HYPOID REAR AXLE**—for longer life on all models. **TORQUE-ACTION BRAKES**—on all wheels on light- and medium-duty models. **TWIN-ACTION REAR WHEEL BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—greater holding ability on heavy-duty models. **NEW RIDE CONTROL SEAT*** eliminates back-rubbing. **NEW, LARGER UNIT-DESIGNED PICKUP AND PLATFORM STAKE BODIES**—give increased load space. **COMFORTMASTER CAB**—offers greater comfort, convenience and safety. **PANORAMIC WINDSHIELD**—for increased driver vision. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—easier, safer handling. **ADVANCE-DESIGN STYLING**—rugged, handsome appearance.

**Optional at extra cost. Ride Control Seat is available on all cab models, "Jobmaster 261" engine on 2-ton models; truck Hydra-Matic transmission on ½-, ¾- and 1-ton models.*

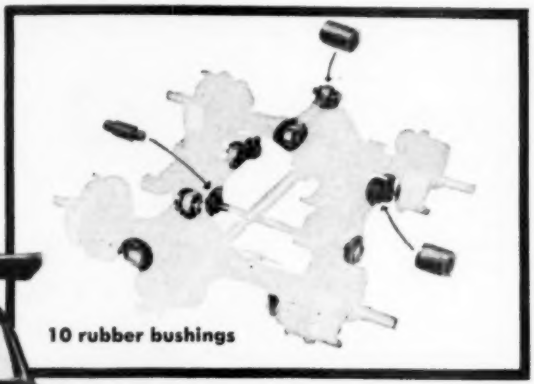
MORE CHEVROLET TRUCKS IN USE THAN ANY OTHER MAKE!

INTERNATIONAL LEADS AGAIN...

NEWEST, FINEST BOGIE

IN THE 6-WHEEL FIELD

The new INTERNATIONAL bogie provides a new exclusive torque arm design straddle mounted at axle and frame, for greatly increased strength, and new rubber bushings on torque arms, equalizing beams and radius rods for reduced road shock, and elimination of 10 lubrication points. A new self-contained brake and cylinder unit cuts servicing costs, offers greatly increased protection from damage in off-highway operation.



10 rubber bushings

Once again, INTERNATIONAL makes the big news in 6-wheel bogie design. Once again, the pioneer of 6-wheel development and 6-wheel sales leader for 19 straight years tops 'em all in features for efficiency, economy, and long life.

In today's INTERNATIONAL 6-wheelers you get everything that's new and everything that's best, plus such extra-value features as the famous, proved INTERNATIONAL power divider and third differential.

Ask your INTERNATIONAL Dealer or Branch for full facts . . . and a demonstration. You'll quickly see why —for off-the-road or over-the-highway—an INTERNATIONAL Truck with new INTERNATIONAL bogie is the world's best 6-wheel buy.

24 new 6-wheel models!

GVW ratings, 22,000 to 90,000 lbs. with new INTERNATIONAL bogie or trailing axle. Engines from 130 to 356 horsepower. Choice of gasoline or LPG power. Diesel engines available in models with GVW ratings of 30,000 lbs. and over. Transmissions, axle ratios for any needs. America's most complete truck line—170 basic models from ½-ton pickups to 90,000 lbs. GVW off-highway models.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

International Harvester Builds **McCORMICK**® Farm Equipment and **FARMALL**® Tractors . . . Motor Trucks . . . Industrial Power . . . Refrigerators and Freezers.

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"Standard of the Highway"

BEAT

the engineers' estimates...

on YOUR bids.

Gradall

DIVISION OF WARNER & SWASEY Cleveland

GRADALL DISTRIBUTORS IN OVER 75 PRINCIPAL CITIES
IN THE UNITED STATES AND CANADA

GRADALL CUTS JOB-TIME...CUTS COSTS...ON ALL THESE JOBS... Excavating
Trenching • Backfilling • Ditching • Ditch Cleaning • Grading • Loading • Sloping
Pavement Removal • Stock Piling • Hand Finishing and Clean-up • Road Widening
Placing Tile, Culverts, Curbs, Tanks • Tree Removal • Snow Removal • Maintenance Work

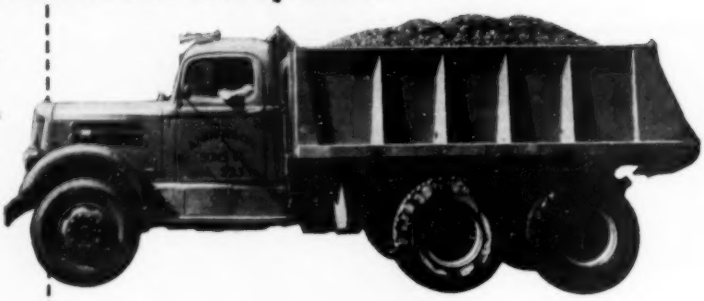
YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

Rugged White "Ten-Wheelers"...

ON THE JOB day after day, they keep ready-mixed concrete on the move for W. E. Anderson Sons Co., Columbus, Ohio. These tandem-axle Whites with 4½-yard mixers have the stamina and durability to keep on tight schedules with the very minimum of downtime. The extra power of the Whites pays off first day in service and for more years!

Sturdy White Tandem Dumps...

It's the same quality story in aggregate delivery and stock piling by W. E. ANDERSON SONS CO. White tandem axle dumpers with nine yard capacity. Plenty of White Mustang Power for the big loads and every unit sturdy and dependable without sacrificing payload.



AND NOW THE NEW "CENTIPEDE"

for W. E. Anderson Sons Co., Columbus, Ohio

Here's the newest of the famous Whites in ready-mix service—the White Steering Pusher "Centipede". Better weight distribution and flotation within state limits...maneuverability and road stability even on rugged terrain . . . and economical Mustang power! Handles 6-yard mixer —24,000 lbs. payload and 100 gallons of water within state limits.

Get facts about this great line of Whites for *your* business. See *your* White Representative!

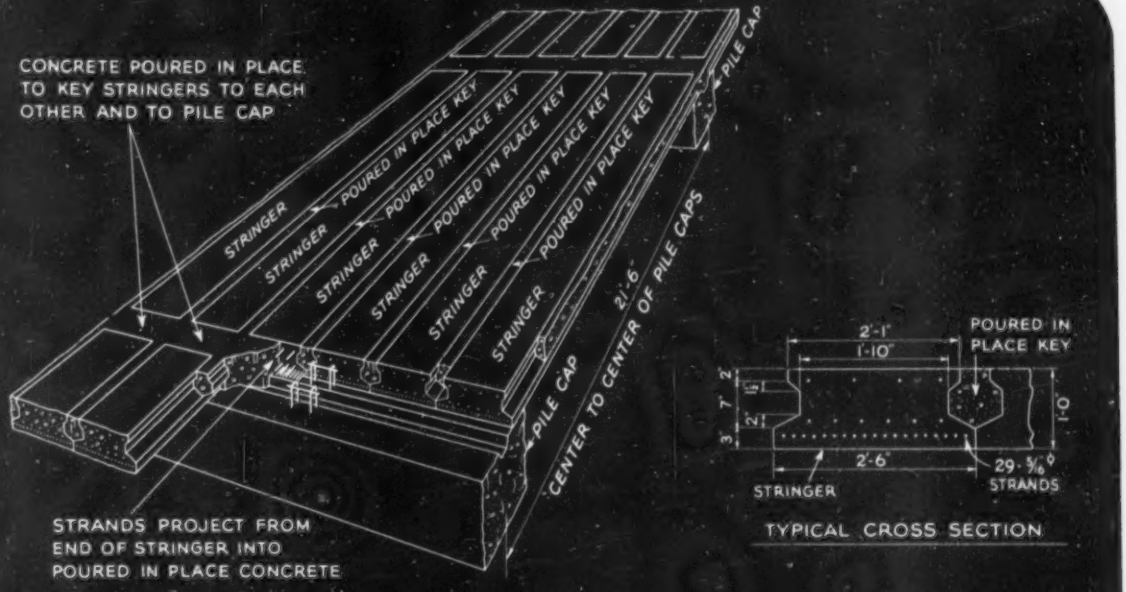
White

THE WHITE MOTOR COMPANY, Cleveland 1, Ohio

FOR MORE THAN 50 YEARS THE GREATEST NAME IN TRUCKS

FOR DEPENDABLE TENSIONING OF PRESTRESSED CONCRETE MEMBERS . . .

ROEBLING WIRE AND STRAND



Pier "C", under construction at Hoboken, N. J. for the Port of New York Authority, is 730 feet long x 350 feet wide. Pile caps which are post-tensioned with Freyssinet type cables of .276" Roebling wire are 21½ feet center to center. Deck is made up of 4500 precast stringers 2½ feet wide, 1 foot deep, 21 feet long. Stringers are pre-tensioned bonded type made with Roebling ⅛" diameter prestressed concrete strand . . . Erection, including fabrication of prestressed concrete members, by J. Rich Steers, Inc., Prestressed concrete details by Freyssinet Company, Inc., both of New York.

IN PRE-TENSIONING, where wire or strand is prestressed between anchorages before the concrete is cast, the prestress is transferred to the concrete through bonding action. For this reason, Roebling high tensile steel wire and strand are so processed as to afford maximum bonding characteristics . . . and this, combined with superior strength, has put Roebling tensioning elements way out front in the rapidly-growing swing to prestressed concrete.

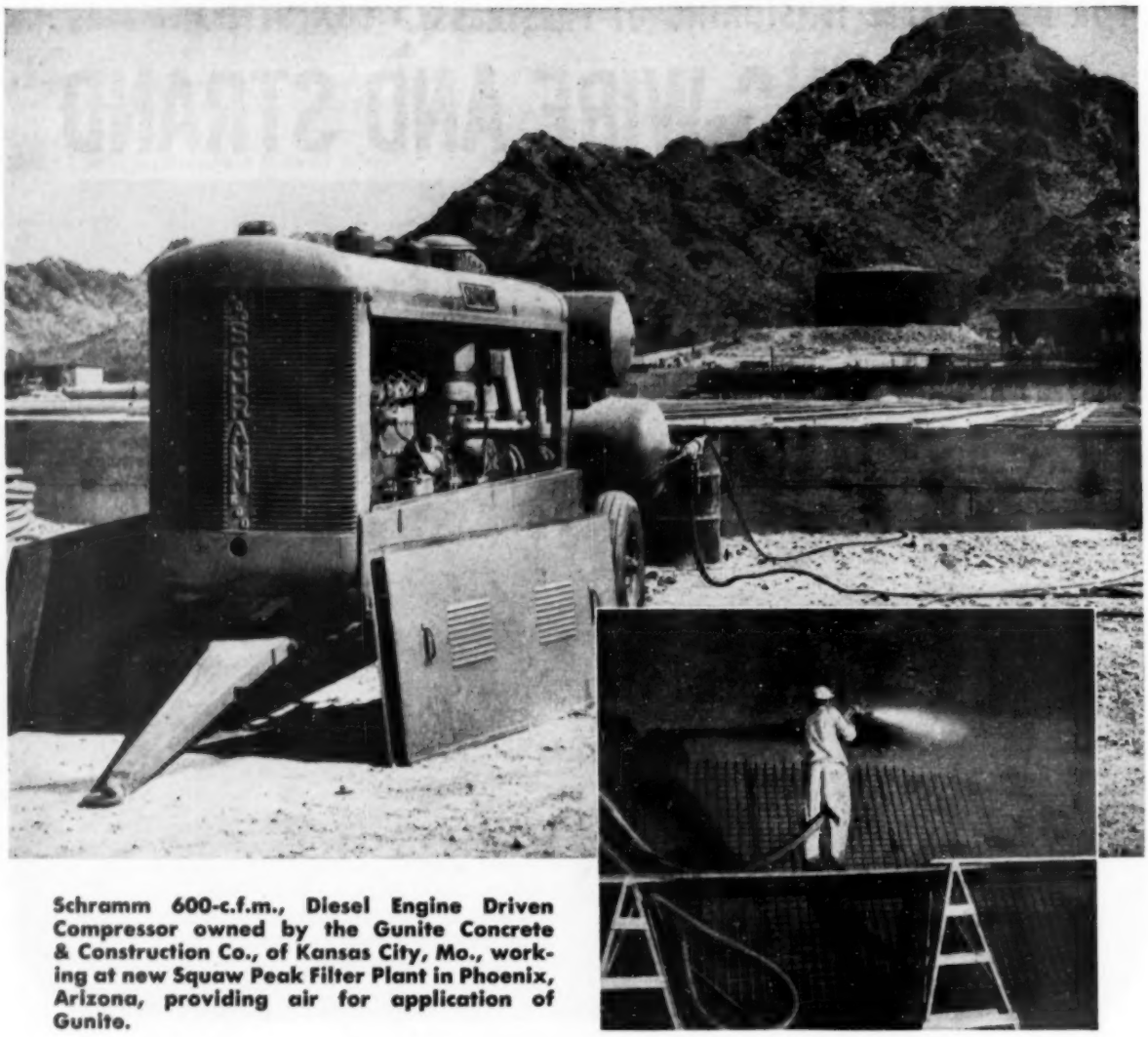
Roebling materials for pre-tensioning were developed to facilitate the fabrication of prestressed concrete members on a standard production basis. This involves fabrication at a central plant where quality and labor practices can be controlled, and costs held to a minimum. Then, as with the Hoboken pier, (illustrated here), the finished members are carried to the construction site and erected directly from the truck.

Roebling engineers are always ready to study the designs of prestressed concrete structures and to offer suggestions as to the best tensioning elements for specific applications. John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • ROCHESTER, 1 FLINT ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY



Schramm 600-c.f.m., Diesel Engine Driven Compressor owned by the Gunite Concrete & Construction Co., of Kansas City, Mo., working at new Squaw Peak Filter Plant in Phoenix, Arizona, providing air for application of Gunite.

Here's why you should use the *SCHRAMM MODEL 600*

FUEL SAVINGS UP TO 50% . . . Pneumastat control . . . Modern engine design . . . Proper operating speeds . . . Less horse power required by compressor . . . Super-efficiency compressor design.

SIMPLIFIED DESIGN . . . Fewer parts . . . Engine parts are interchangeable with compressor parts for lower maintenance . . . Cam operated mechanical intake valves provide greater efficiency.

SAFETY FEATURES . . . Electric push-button starter . . . Stronger, 400# test air receiver . . . Heavy grill for radiator protection . . . Easy accessibility to operating parts . . . No protruding parts.

MORE PLUS FEATURES . . . Tool boxes large enough to carry complete assortment of tools . . . Engine and Compressor cooled by water and unit can be operated with doors in place . . . Dual fan belts.

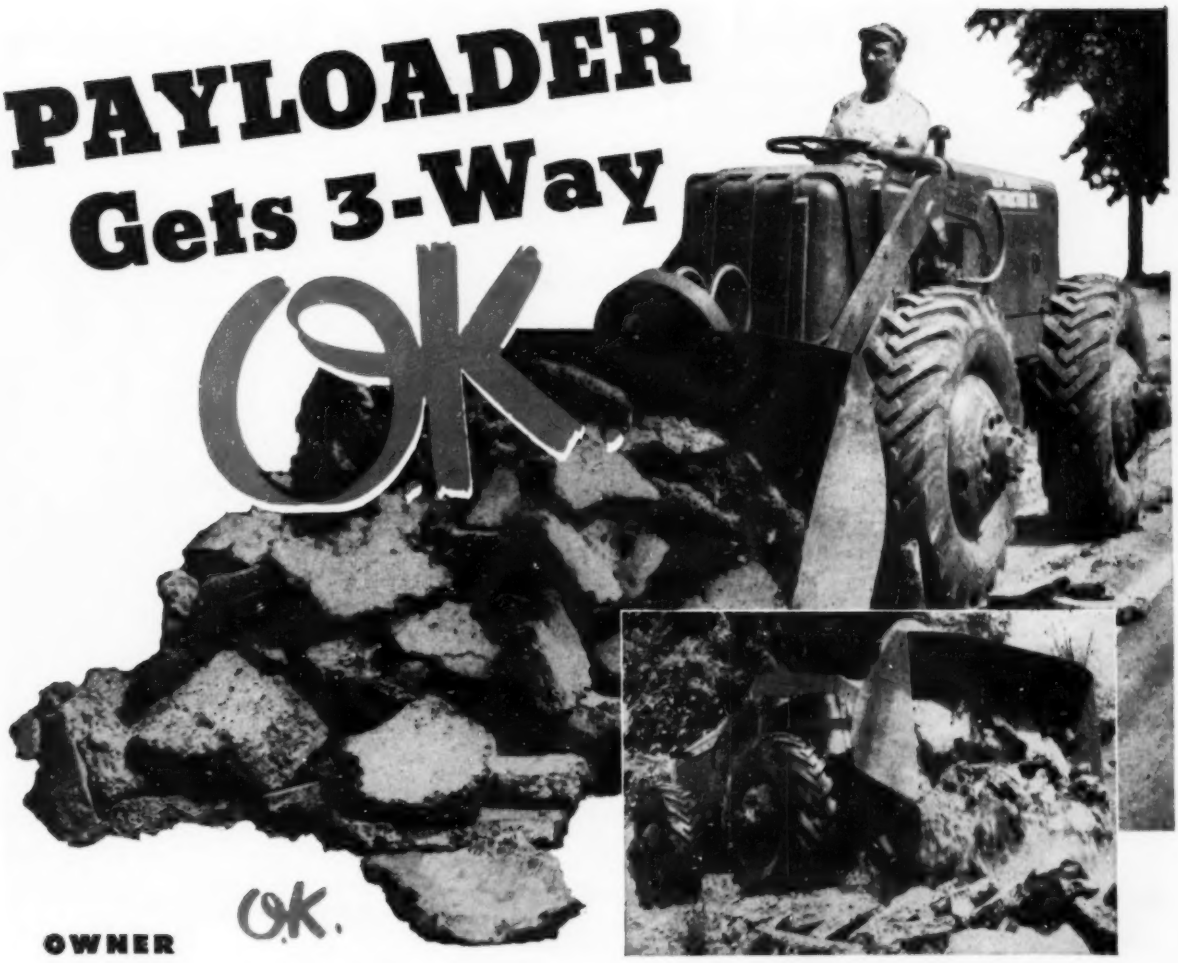
SCHRAMM, INC. • *The Compressor People* • **WEST CHESTER, PENNSYLVANIA**

SCHRAMM AIR COMPRESSORS

A SIZE AND MODEL FOR EVERY AIR NEED

20-35 60 105 210 315 600

PAYLOADER Gets 3-Way O.K.



OWNER

"I couldn't get along without my Hough 'PAYLOADER'. It does a rugged job and is easy to handle when the going is rough", says Joseph J. Girardi, President of New Rochelle Construction Co. O.K.

SUPERINTENDENT

"I have no trouble staying on the job schedule with the Hough 'PAYLOADER'. There is not another machine on the market that can do the job it does", says Mr. Girardi's Superintendent.

OPERATOR O.K.

"A Hough 'PAYLOADER' is a fine machine. It is easy to operate, with good visibility", says the operator of this 4-wheel drive Model HR "PAYLOADER".

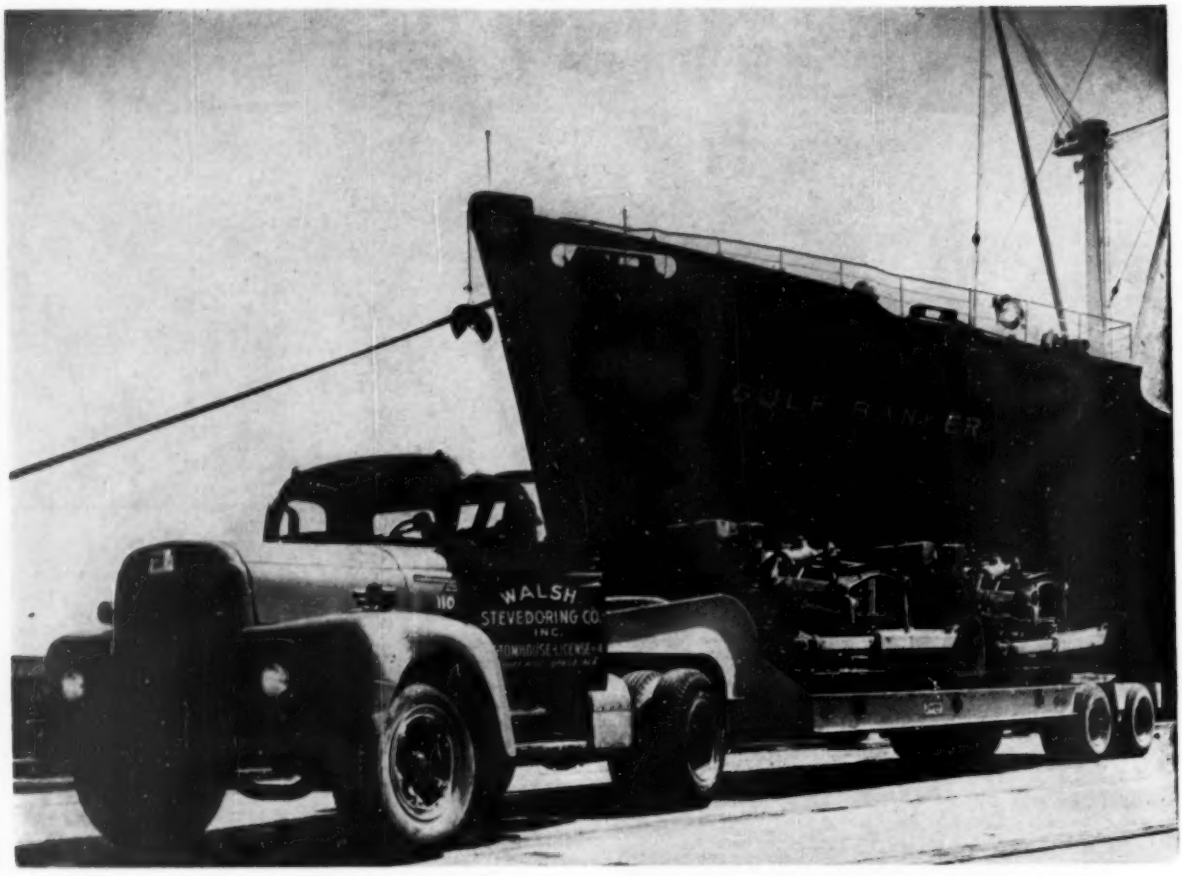
You too are assured of getting the latest and best in tractor-shovels when you buy a "PAYLOADER". You have a choice of a complete line to best fit your needs — sizes from 12 cu. ft. to 1½ cu. yd. bucket capacity — choices of 4-wheel drive, rear-wheel drive or front-wheel drive — gasoline or diesel power. Your nearby Hough Distributor is ready to give you complete information. The Frank G. Hough Co., 768 Sunnyside Ave., Libertyville, Illinois.

WRITE for name of your Hough Distributor and information on the complete "PAYLOADER" line of seven sizes.

PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920

VERSATILE and RUGGED...the Dependable DORSEY MODEL MTS



The varied routine of stevedoring imposes loads of unusual bulkiness as well as weight, but in all situations Walsh Stevedoring Company of Mobile finds Dorsey Low Bed highly maneuverable, fast and reliable. Walsh uses the trailer to move bulldozers, cranes, lift trucks, etc., from dock-to-dock and port-to-port.

"It takes expert operators for this kind of job and they really put hauling equipment through its paces. Our men like the way a Dorsey handles and it never gives a bit of trouble," says Shop Supt. William Brady.

In construction as well as stevedoring "time lost is money lost"—and Dorsey Heavy Duty Trailers are saving time on hundreds of jobs all over the world. Dorseys are designed for easy hauling and engineered to provide an extra margin of strength under unusual strain. Beam strength and tire capacity are conservatively rated, for safe hauling and extra-long service.

DORSEY TRAILERS

See your Dorsey Distributor or wire us collect—our engineers are at your service.

DORSEY TRAILERS • ELBA, ALABAMA

Distributors: A few protected territories for Dorsey Heavy Duty Trailers are still open. Inquiries invited.

THERE'S A DORSEY HEAVY-DUTY TRAILER FOR EVERY NEED

Oil Field Floats

Capacities up to 75,000 pounds. Loads easily, travels swiftly.

Tilt-to-Load

Easy to load and to handle. For fast, economical service.

Model "MK"

10 or 15 ton capacities. Level or drop decks. Semi or full trailers.

Model "MT"

35 to 75 ton capacities, with up to 100 tons on special order.

92 net hp--key to profit

This rugged LS-85 loads out up to 1000 yards of tough basalt rock per 8-hour shift.

This rock-busting LS-85 not only delivers more net hp . . . it's built to handle it!

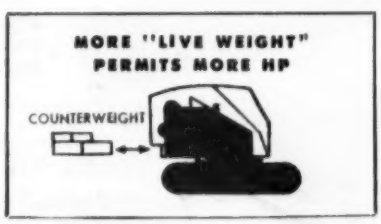
NET delivered hp—not engine model alone—determines how fast and easy your digging goes. More net hp speeds digging, minimizes stalling—digs and swings without pause. The heavy-duty Link-Belt Speeder LS-85 with diesel engine delivers more *net* hp than any other ¾-yd. rig.

But that's only half the story. The LS-85 is *not* overpowered. All-welded, stress-relieved construction and greater *live weight* permit continuous operation under full power without premature clutch, structural or transmission trouble.

For important facts on how to land more bids without shaving profit, ask your distributor or write for catalog No. 2317 on the ¾ yd. LS-85.

LINK-BELT SPEEDER CORPORATION
Cedar Rapids, Iowa

13.391



COMPARE ¾-yd. shovel-cranes with and without counterweight. That test spotlights the size, weight and heft built into the working parts and structural members. You'll find the LS-85 has more "live weight" than comparable machines.

BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND WHEEL-MOUNTED SHOVEL-CRANES

LINK-BELT SPEEDER

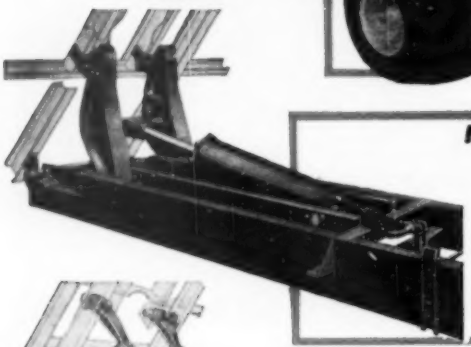
A Complete Line of PERFECTION HOISTS

for every Make and Model Truck

All parts of PERFECTION Hoists — pumps, power take-offs, and cylinders are engineered and guaranteed by PERFECTION. Each part is carefully interdesigned with all other parts, to produce units of exceptional efficiency, power, and dependability.

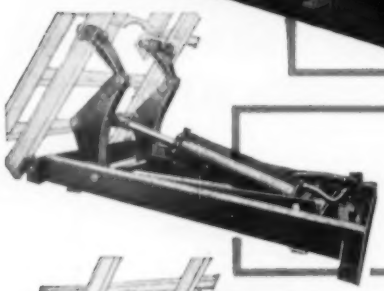
Model 7780 Telescopic

3-stage, telescopic, dual cylinder design provides tremendous lifting capacity with least weight, simple construction, and smooth operation. Direct upward lift is applied at the center of the load. For mounting on trailers with bodies up to 30 cu. yard capacity. Extra heavy-duty service.



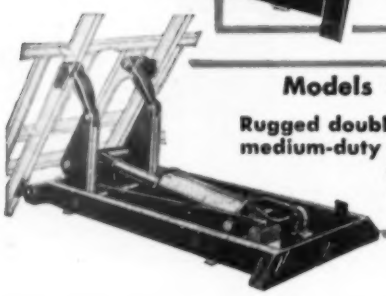
Models 727 • 827 • 1027 • 1034 Roll-A-Lift

A constant-low-pressure-type hoist that develops tremendous lifting capacity in relation to its piston displacement. Engineered for those jobs that require a rugged and powerful hoist. Four standard models cover body capacities from 6 to 20 cu. yards. Heavy-duty service.



Models 725 • 820 • 825

Compound-type, double lift-arm design, for medium and heavy-duty service. Three standard models for body capacities of 6 and 7 cu. yards.



Models 615 • 715 • 715L • 720

Rugged double lift-arm hoists for light and medium-duty service. Four standard models cover body capacities from 1½ to 6 cu. yards.

Models 615B 715B • 720B

Low-mount, double lift-arm hoists for mounting with medium and heavy-duty platform and stake bodies. Three models for bodies from 9 ft. to 16 ft. long.

Write for Literature Today

TRUCK BODIES and HYDRAULIC HOISTS

THE PERFECTION LINE

STANDARD and SPECIAL UNITS IN ALL SIZES — FOR ANY USE

Engineered, Manufactured and Guaranteed by

THE PERFECTION STEEL BODY CO.

Dept. R-24, Galion, Ohio, U.S.A.

Tandem Jaeger Spreaders lay new Tennessee material

18″ of stiff base mix placed true to grade, ahead of weather

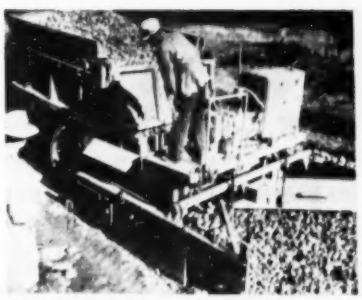
Tennessee's new base material is a dense and sticky pug-mill mixture of crushed limestone containing a high percentage of fines, calcium chloride and water. It looks and feels a lot like low slump concrete.

One of its first applications required Knoxville Construction Co. to place 18″ of this material in three 6″ courses. Each course had to be laid true to grade and cross section and rolled immediately to insure proper compaction and avoid weather hazard.

Two Jaeger self-propelled Aggregate Spreaders, used in tandem, placed parallel strips which could be rolled in one operation. A side bleeder gate, in the rear spreader, provided material for blending the lanes. Straight-edge runners, carrying the spreaders' strike-offs, averaged out initial subgrade irregularities and placed the successive courses accurately to grade.

Placement by this method was so fast that progress depended entirely on material deliveries. Daily production varied from 3000 to 3300 tons. The two spreaders could easily have laid 6000 tons had the material been available.

If you have the job of laying any type of base or surface aggregate, plant-mixed stabilized soil or free-flowing bituminous material, accurately and at low cost, talk to your Jaeger distributor or send for Jaeger Aggregate Spreader Catalog SPS-1.



Laying stone without hand labor: Paul L. Britton, Inc. accurately placed 8-ton truck loads in 45 seconds, for highway base near Kinnard, Pa.

Laying Airport Base: Del Webb and San Xavier Construction Companies used Jaeger Spreader to place stabilized soil base for 200,000 sq. yds. of runway at Tucson Municipal Airport.

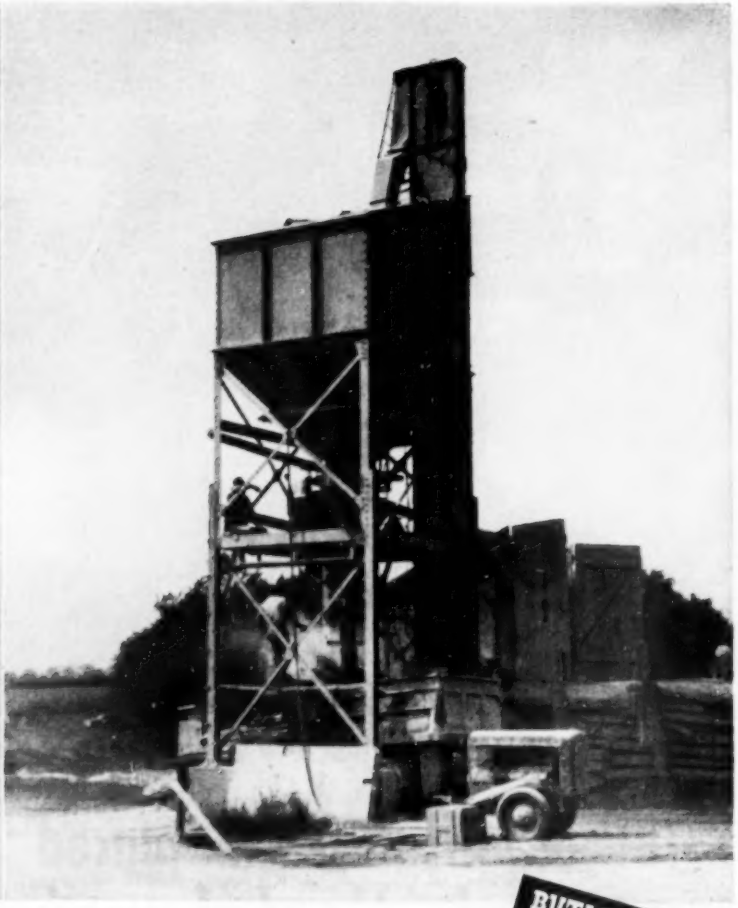
THE JAEGER MACHINE COMPANY

223 Dublin Avenue • Columbus 16, Ohio

CONCRETE SPREADERS and FINISHERS • AIR COMPRESSORS • PUMPS • CONCRETE MIXERS • LOADERS

Built in '37

This Veteran Butler Plant Paces Today's Top Paving Production!



BUTLER Cement Batching Plant built in 1937 — still in echelon production.

IN 17 years of cement batching, during which the speed of laying a pavement has literally soared, this 1937 BUTLER Plant has met the demand every step of the way.

Now, on a 6½ mile, 4 lane, $4,000,000 Lancaster (Pa.) by-pass the veteran batched for a 34E dual drum paver in laying 122,279 square yards of concrete. The pavement was a 7-inch slab covered with a reinforcing screen and topped with 2 inches more of concrete.

The point is:

in 1937 BUTLER Engineers designed and built plants to match the 1954 demand. And in 1954 BUTLER Engineers are designing and building electronically controlled, automatic batching equipment to meet the production you'll require from now until 1971 — and beyond.

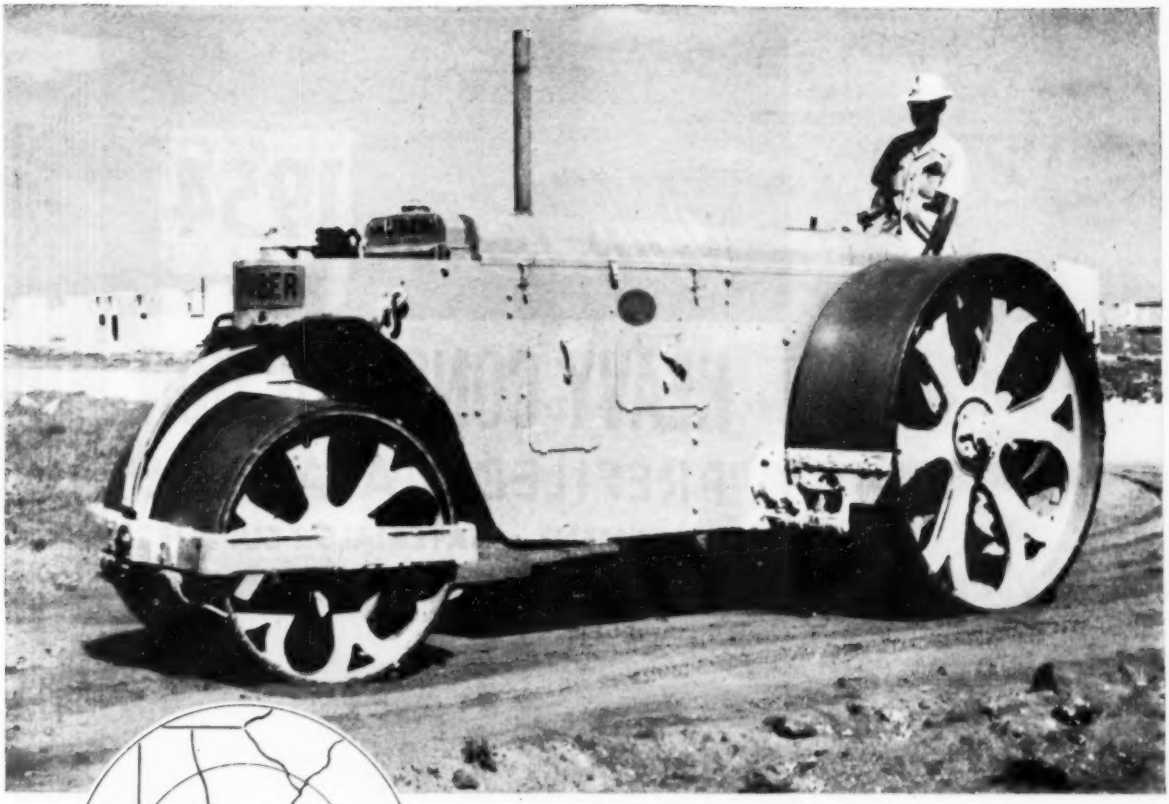
That's why it's just smart business to buy BUTLER.

Have you read this recently published Bulletin on BUTLER Roadbuilders' Plants? Completely illustrated, it shows all of BUTLER standard features and profit-making accessories. BUTLER specializes in portability. Ask for Bulletin 205 to find out how. *Send a postcard today.*

BUTLER BIN CO.

959 BLACKSTONE AVENUE

WAUKESHA, WISCONSIN



Florida Contractor Holds a winning Pair... TWO HUBERS

SECOND HUBER 10-TON ROLLER HELPS FIRM EXPAND

A Miami, Florida contractor who has built streets for many residential developments is the owner of two Huber rollers — a winning pair.

Five years ago the company bought its first Huber 10-ton three-wheel roller. The second one was added in 1951.

The procedure used on many projects is to sprinkle and roll an 8-inch course of lime rock to a smooth, hard surface which then is swept and sealed with asphalt at the rate of 3/10 gal. per square yard. This is covered with screenings or coarse sand.

This firm's experience with Hubers is typical, for Huber rollers make friends wherever they are used. Expert design and quality construction pay off in terms of fast, powerful and dependable service. Talk to your nearest Huber Distributor about dependable Huber road machinery. You, too, will like it.

HUBER MANUFACTURING COMPANY
MARION, OHIO, U. S. A. — Since 1862

HUBER

MANUFACTURERS OF HUBER MAINTAINERS, GRADERS AND COMPLETE LINE OF ROLLERS

It's in your Office Now . . .

KEEP IT HANDY—

USE IT OFTEN—

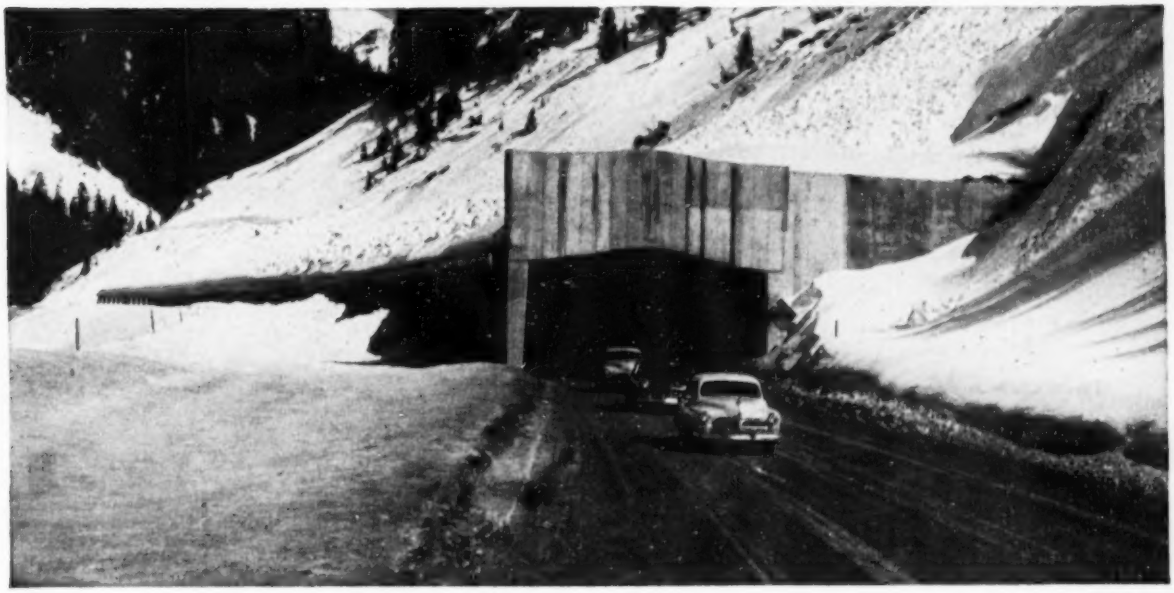
Your most useful source of Buying Information

- This book saves you cabinet and floor space and the secretarial time that would otherwise be spent in classifying and filing individual manufacturers' catalogs.
- It saves you, too, the time and trouble of writing to manufacturers for the information you need. Here are enough facts to enable you to study the product that interests you and to decide whether to call your local dealer or distributor for decisive action.
- When you want information quickly, on a certain class of product or on the product of a specific manufacturer, turn first to the index for the name or trade name of the product in which you are interested and then to the manufacturers' catalog which is arranged in alphabetical order by manufacturers' name.

When you are in the market for new construction equipment, materials or supplies, turn to Gillette's Heavy Construction Prefiled Catalogs for information on what to buy and from whom. Here's the swift, economical and satisfying way to make your pre-purchase studies. In this single volume many of America's leading manufacturers of these products have placed their catalogs, many of them specially designed for your convenience—"boiled down" to save you time and energy.

DOWFLAKE® CUTS COST OF HIGHWAY ICE CONTROL

Easier loading, faster spreading, lighter abrasive applications save time and money



Experience through the years shows that the most economical and effective way to control ice on highways and secondary roads is with abrasives treated with Dowflake® Calcium Chloride.

Take a look at what Dowflake will do for your highways, first from the standpoint of economy:

Dowflake keeps abrasive stockpiles freezeproof and free-flowing, *cutting loading labor costs.*

Dowflake treated abrasives bite right in—can't be swept away by wind and traffic. *One third less abrasive is needed.*

Dowflake makes the abrasive easier to handle—distribution time is greatly reduced. *Again, lower labor costs.*

Now, look what Dowflake does for safer highways:

Because Dowflake makes the abrasive bite right in—*it goes to work immediately.*

Dowflake firmly anchors the abrasive—*protection lasts many times longer.*

Dowflake treated abrasives give double protection—*the abrasive provides traction while Dowflake melts the ice.*

PELADOW®—Dow's New High Concentrate Calcium Chloride—94-97%

This pellet form of calcium chloride is especially designed for bulk shipment. Peladow's high concentration means lower freight and handling costs and less product required per application. Write Dow for complete information. THE DOW CHEMICAL COMPANY, Midland, Michigan.

you can depend on DOW CHEMICALS

DOW

"Euc" lever-type Scrapers

Pay off in Performance

Getting a heaped load of 21 cu. yds. at Jemez Dam in New Mexico.

- 15.5 cu. yds. struck
- 275 h.p. engine
- 10-speed transmission
- Interchangeable hydraulic jacks
- 4-section reversible and interchangeable cutting blades
- Lever actuated bowl, apron & ejector—only 13 ft. of cable

Lever action, an exclusive Euclid Scraper development, offers many profit-making advantages that you can't get in any other scraper. It is the most important advancement in scraper design and performance in many years!

Just think of it—no cables to break because bowl and apron lift and the positive roll-out ejector are actuated by interchangeable hydraulic jacks. Only 13 feet of long-life cable, part of the apron lift, are used. There's no danger of a broken cable causing damage or delay—ever, and especially on high speed hauls. There's no costly cable replacement and lost time threading cable through dozens of sheaves and pulleys. And most important of all is the top performance and high job availability—the low cost production—you can count on with "Eucs" on your job.

Get the complete story from your Euclid distributor and check all of the features that mean more loads and bigger payloads per hour at lower cost. Just ask for your copy of Form B502.

EUCLID DIVISION, GENERAL MOTORS CORPORATION, CLEVELAND 17, OHIO

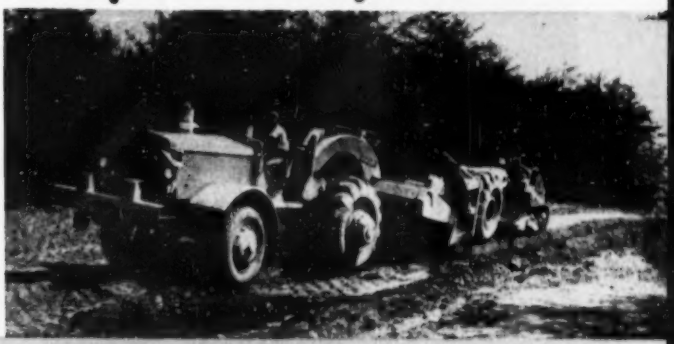
Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

"Eucs" are turning in top performance records on all kinds of jobs . . . *everywhere!*

At Bellingham, Washington, 3 Euclid lever-type Scrapers are being used by Morrison-Knudsen Co., Inc. for grading a refinery location. Adjustable 4-section cutting blades provide fast, efficient loading in any type of material. These hard-faced blades are reversible and interchangeable.

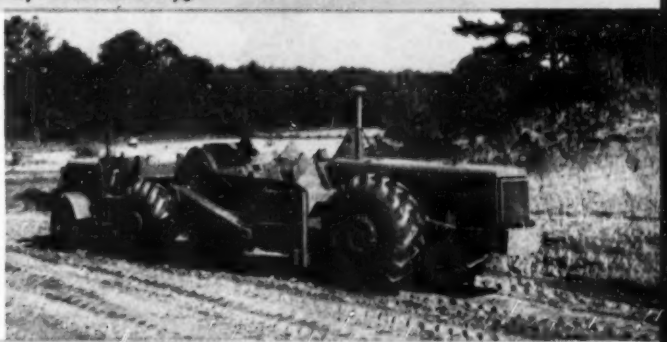


For smaller earth moving jobs, such as this farm-to-market road in Southern Virginia, the 12 cu. yd. (struck) "Euc" Scraper is a versatile, low-cost dirt mover. Like larger Euclid scrapers, bowl, apron and ejector operations are lever actuated—no down time due to cable breakage!

Working in wet, heavy clay overburden the "Euc" lever-type Scrapers at this Ohio quarry had "hardly any down time" according to the contractor . . . they worked efficiently during wet weather and on steep grades where single axle tractor scrapers had to be parked because they simply couldn't "make the grade." Powered by a 275 h.p. engine, with a 10-speed transmission, the Euclid Scraper takes tough jobs in stride.

As a result of competitive demonstration with several other scrapers, Skousen-Hise Contracting Co. bought "Eucs" for their road job east of Albuquerque, New Mexico. Faster average travel speed, due to better safety and stability of the 4-wheel tractor and from 5 to 20 seconds faster loading, were important factors in the Euclid out-performing its closest competitor by more than 17%.

By actual scale weight "Eucs" carry up to 20% more payload than other scrapers of comparable size because of their good load compaction. At Whittier Narrows Dam in California top extensions enabled the Euclid Scrapers to get heaped loads—over 20 cu. yds.—of sand. Contractors on the project are A. Teichert & Sons, Inc. and Bressi & Bevanda Constructors.



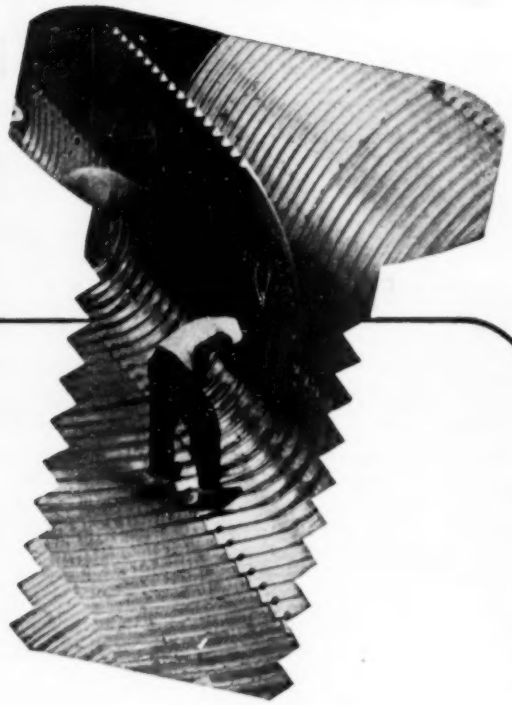
Only Euclid builds a Twin Power Scraper—the scraper that has its own pusher! Two 190 or 200 h.p. engines with torque converters and torqmatic transmissions make the "Twin" a one-man earth moving crew . . . heaped capacity at 1:1 slope is 24 cu. yds. On this road project in Alabama the maneuverability of the Euclid permitted turns in cuts only 40 feet wide.

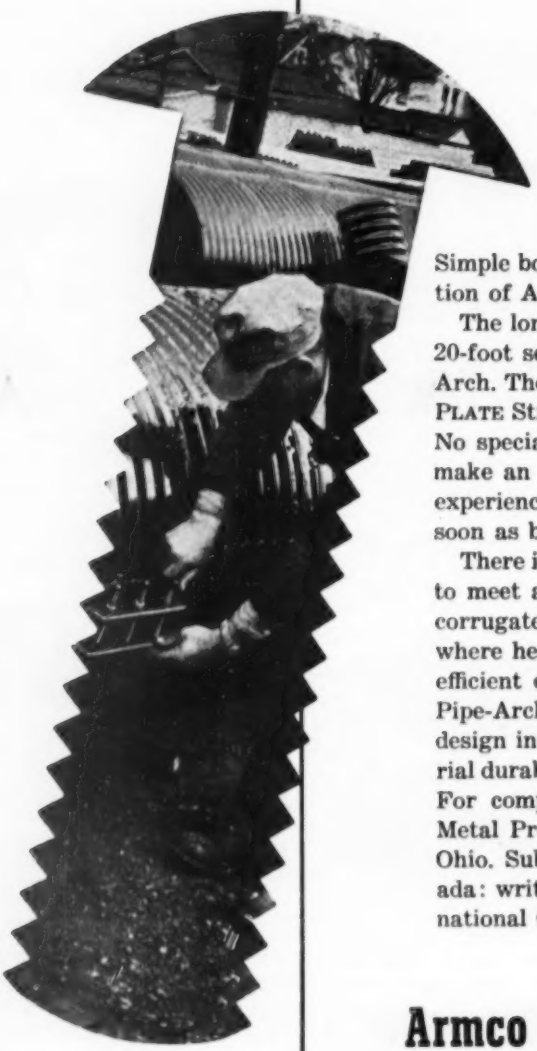
***WRITE TODAY** for performance data and a copy of the new catalog folder on Euclid lever-type Scrapers*

EUCLID DIVISION
GENERAL MOTORS CORPORATION, CLEVELAND 17, OHIO

EUCLID SPECIALIZED EQUIPMENT FOR MORE LOADS PER HOUR AT MORE PROFIT PER LOAD

These Bolts Hold Down Drainage Costs





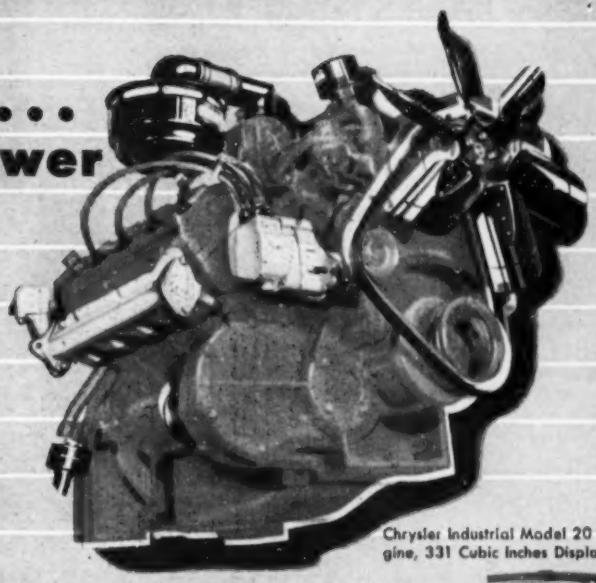
Simple bolted assembly means quick, low-cost installation of Armco Corrugated Metal Drainage Structures.

The long bolt tightens simple coupling bands to join 20-foot sections of Standard Corrugated Pipe or Pipe-Arch. The short bolt is used to assemble Armco MULTI-PLATE Structures from pre-curved corrugated sections. No special equipment is needed and a small crew can make an installation in a few hours without previous experience. Traffic can move across the structure as soon as backfill is completed.

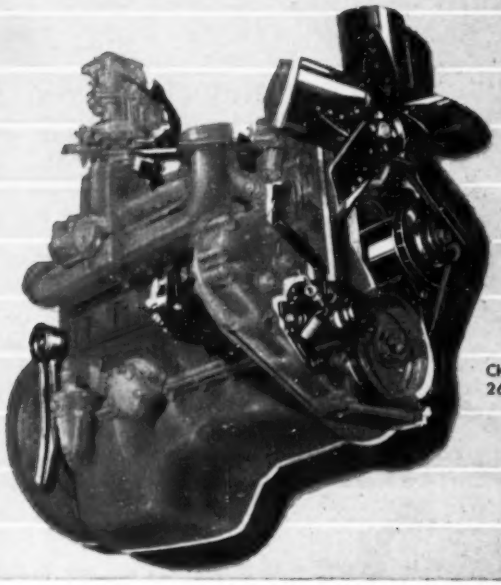
There is a size and type of Armco Drainage Structure to meet almost every drainage need. Standard, round corrugated metal pipe is ideal for smaller culverts; where headroom is limited Armco Pipe-Arch provides efficient drainage; and Armco MULTI-PLATE Pipe and Pipe-Arch extend the advantages of corrugated metal design into the larger sizes. Ample strength and material durability assure years of maintenance-free service. For complete information, write Armco Drainage & Metal Products, Inc., 1134 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

Armco Drainage Structures ARMCO

For greater PAY in your PAYloads... specify *CHRYSLER* power

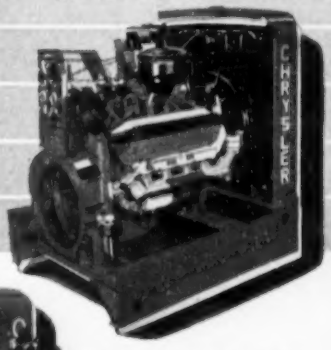


Chrysler Industrial Model 20 V-8 Engine, 331 Cubic Inches Displacement.



Chrysler Industrial Model 16 Engine, 265 Cubic Inches Displacement.

Chrysler Open Power Units include the complete engine, skid base, radiator and grille, instruments and instrument panel, flywheel and flywheel housing. (Pictured is V-8 Open Power Unit, which also includes a twenty-five gallon fuel tank.)



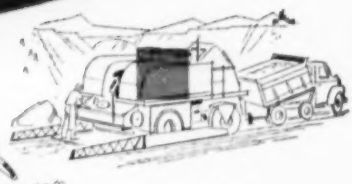
Chrysler Enclosed Power Units have the complete engine, instruments, instrument panel, skid base, fuel tank, radiator and grille, as well as fully enclosing sheet metal—side panels and hood top panel.

There are ten Chrysler Industrial Engines and Power Units, from 217 cubic inches to 413 cubic inches displacement. All of them operate with gasoline, natural gas or L-P gas fuels.

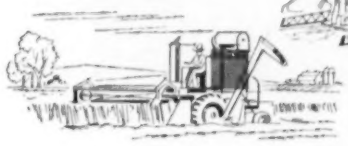
True to the Chrysler tradition, these engines, both In-line 6 and V-8, are among the most advanced design, best engineered and most powerful engines available today in their power ranges. Yet, thanks to famed Chrysler Research, they are constructed of lightweight, highly alloyed steels and allow amazing horsepower to weight ratios.

They are, therefore, ideal engines for most any equipment, regardless of size or silhouette. Let our nearest dealer give you more details, you'll be agreeably surprised to know how inexpensive Chrysler Power—*equipped to meet your specifications*—is . . . that's because Chrysler production facilities and manufacturing know-how allow us to custom-equip engines and make them available at mass-production prices.

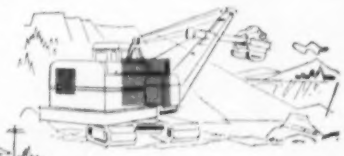
Install Chrysler with confidence. Our nationwide dealer organization assures you good service and fast parts availability. If you prefer, write us: **Dept. 112, *Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.***



Street Paving Machine—powered with Chrysler Industrial Engine.



Farm Combine—powered with Chrysler Industrial Engine.



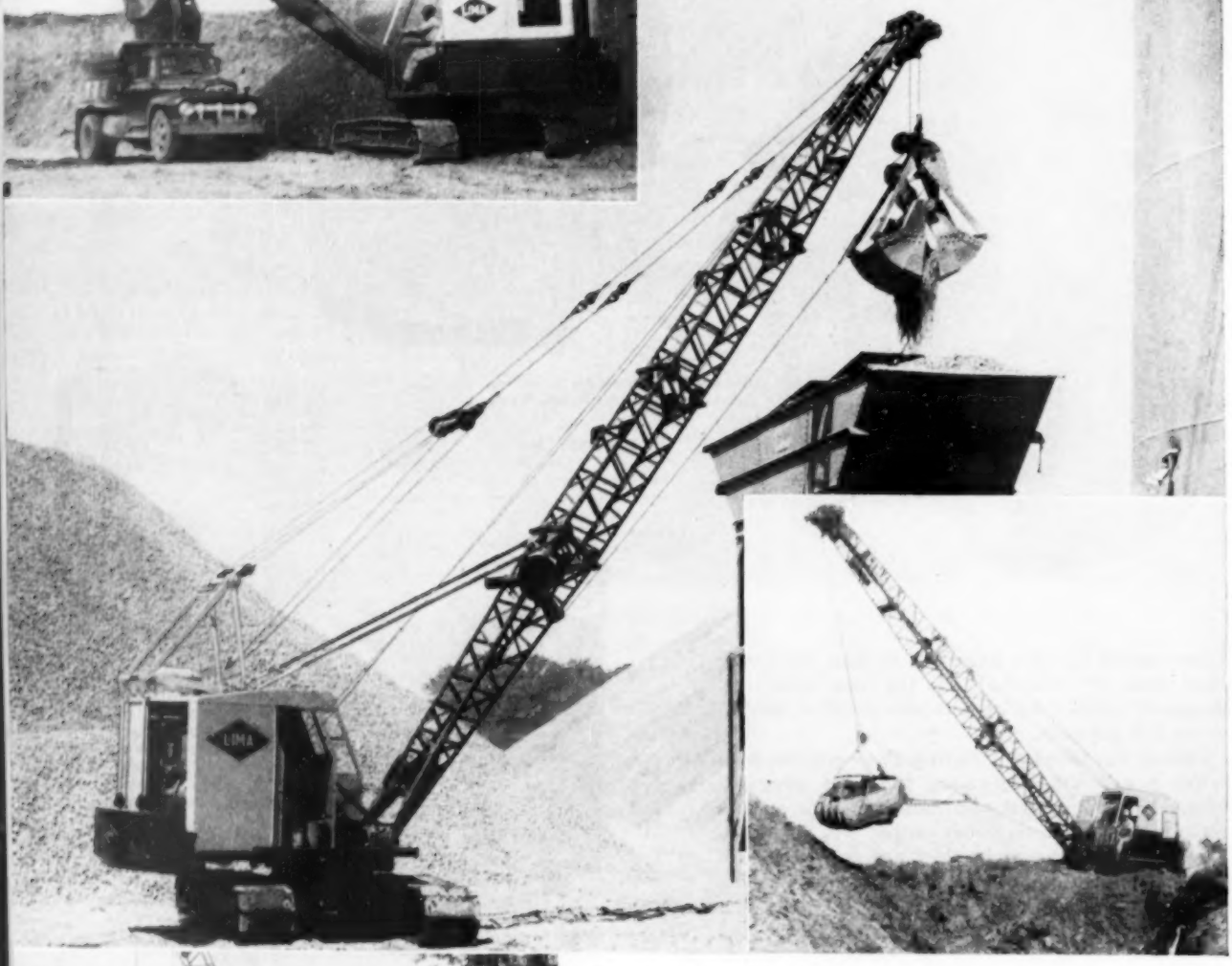
One-Half Yard Shovel—powered with Chrysler Industrial Engine.

Fork Truck—powered with Chrysler Industrial Engine.

CHRYSLER
Industrial Engines

HORSEPOWER **WITH A PEDIGREE**

LIMA



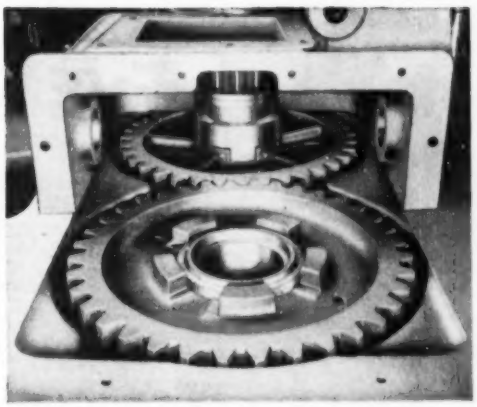
To meet the need for a 25 ton crane and 1 cubic yard shovel, Baldwin-Lima-Hamilton Corporation, is now producing the LIMA Type 44. As a shovel, it is equipped with 20 ft. boom and 15 ft. dipper handle. This latest addition, fills an important spot in the LIMA line, between the famous Paymaster (17½ ton crane—¾ yard shovel) and model 604 (35 ton crane—1½ yard shovel).

Like its smaller brother, (Paymaster, Type 34), the LIMA Type 44 is available, with either crawler or rubber mountings. Wider, longer crawlers for greater stability and double sets of front cone rollers, to distribute the load more equally over a wider area, are some of the major design features.

For your copy of our Type 44 bulletin, please contact your nearby LIMA distributor, or write to Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

Type 44 ANSWERS DEMAND for one yard shovel and 25 ton crane

LIMA incorporates many quality features in versatile shovel—crane—dragline—pull-shovel and truck crane.



Propel and swing gears are enclosed in an oil bath, assuring smooth, quiet operation.

COMPARE! No other machine gives you as much as LIMA!

1. Big capacity drums and sheaves lengthen cable life, by reducing the need for double wrapping and sharp bends in cable.

2. All gears, smaller parts and shafts which are subject to extra wear, are flame or induction hardened for longer life.

3. Main machinery is placed well back of center of rotation, to eliminate excess counterweight.

4. Propel and swing gears and power take-off, are enclosed in sealed oil bath for dirt elimination and smoother, quieter operation.

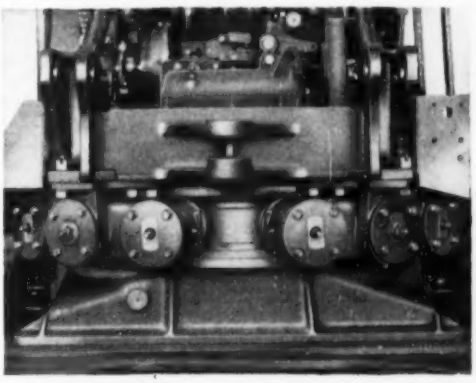
5. Anti-friction bearings, used at all important bearing points, reduce destructive friction, fuel consumption and lubrication requirements.

6. Bronze bushings in tread, idler and drive rollers, are protected by piston-type dirt seal rings and retainers.

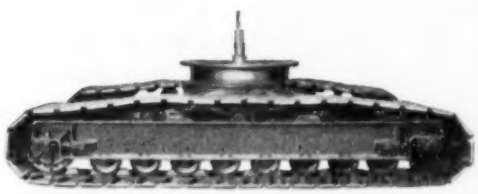
7. Torque converter (optional), automatically adjusts speed to load requirements, minimizing shock loading, making performance smoother and faster.

Wherever you are, you can depend on skilled service and nearby warehouse stocks of parts, to keep your LIMA on the job continuously.

COMPARE and you'll specify LIMA for shovels, (¾ cu. yd. to 6 cu. yds.), cranes, (to 110 tons) and draglines (variable).



The conical rollers are the hook type, four in front and two in the rear. The four front rollers are arranged in pairs and each pair is mounted in an equalizer frame.



An extra long Crawler (15'-0" long, 10'-8" wide), is available for work requiring greater stability.

DISTRIBUTORS IN ALL PRINCIPAL CITIES OF THE WORLD

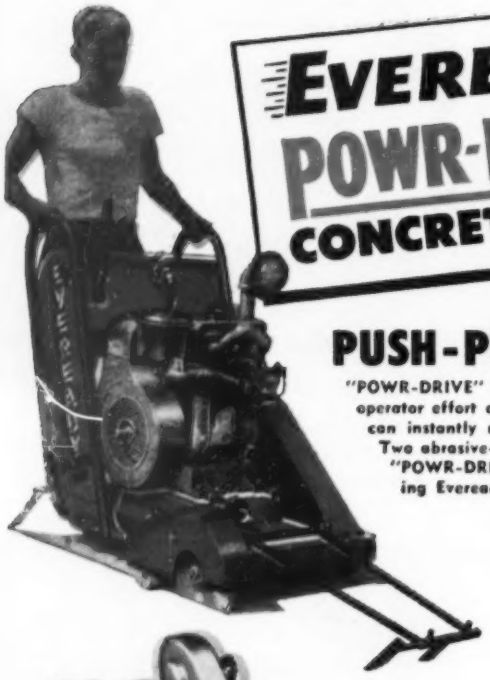
LIMA

SHOVELS • CRANES
DRAGLINES • PULLSHOVELS

BALDWIN BLH LIMA-HAMILTON
Construction Equipment Division

BALDWIN-LIMA-HAMILTON CORPORATION
Construction Equipment Division
LIMA, OHIO, U.S.A.

EVEREADY POWR-DRIVE CONCRETE SAW



Ask Your EVEREADY Dealer for the Most Complete Line of Masonry and Concrete Cutting Equipment

Red-I-Cut

We've taken the— PUSH-PULL Out of Concrete Sawing

"POWR-DRIVE" smoothly drives saw forward at your controlled speed . . . saves operator effort and increases cutting footage per day. With "POWR-DRIVE" you can instantly regulate the cutting speed to your various cutting requirements. Two abrasive-coated wheels act as a friction drive in contact with both rear saw wheels. "POWR-DRIVE" is engaged or disengaged by a convenient foot lever control. See the amazing Eveready "POWR-DRIVE" Concrete Saw at your local Eveready Dealer.

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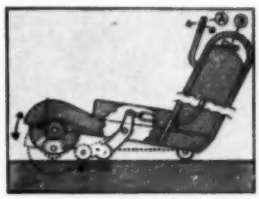

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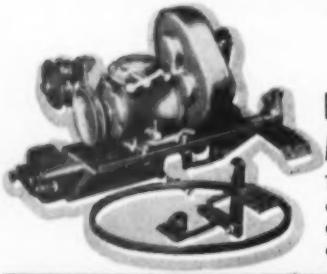

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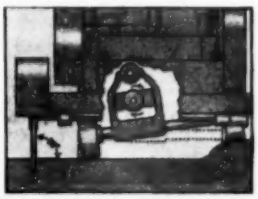

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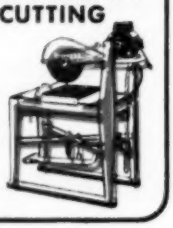
EVEREADY BRIKSAW FOR MASONRY CUTTING



FREE BOOK

FREE BOOK on Masonry cutting . . . requested by more than 18,000 . . . will be sent without obligation . . . or ask your dealer.

Place blade on either side of saw to cut in corners and confined areas. Blade guard, water hose, and front guide wheel marker assembly are all interchangeable.

EVEREADY DEALERS...

in Most Principal Cities in the United States and Canada

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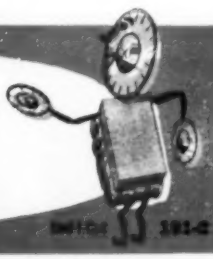
EVEREADY BRIKSAW CO. ● 1509 S. MICHIGAN BLVD. CHICAGO 5G, ILL.



See them now!

NEW FORD T-800
Tandem-Axle BIG JOB.
New 170-h.p. *Cargo King*
V-8. New Power Steering
standard.

New FORD TRUCKS for '54

featuring TRIPLE ECONOMY

Big new savings in the 3 most important truck saving areas

1. NEW Gas-Saving, Low-FRICTION, Overhead-Valve, High-Compression, Deep-Block Engines in all Models!

Now, you get a gas-saving LOW-FRICTION engine in *any* Ford Truck you choose—from 115- to 170-h.p.! New short-stroke design cuts internal friction loss up to 33%, liberates up to 23% more *usable* power.

2. NEW Driverized Cabs! NEW Power Steering! NEW Power Brakes! Fully Automatic Fordomatic Drive!

Ford's 3-man Driverized Cabs cut fatigue! New *Master-Guide Power Steering* standard on T-800 Series, optional on most other BIG JOBS, Power Braking* for ½-ton, Fordomatic* for all light duty models!

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**Available at extra cost.*

V-8 and SIX!

5 GREAT TRUCK ENGINES!

All Low-FRICTION!
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All Overhead Valves!
All Deep-Block design!

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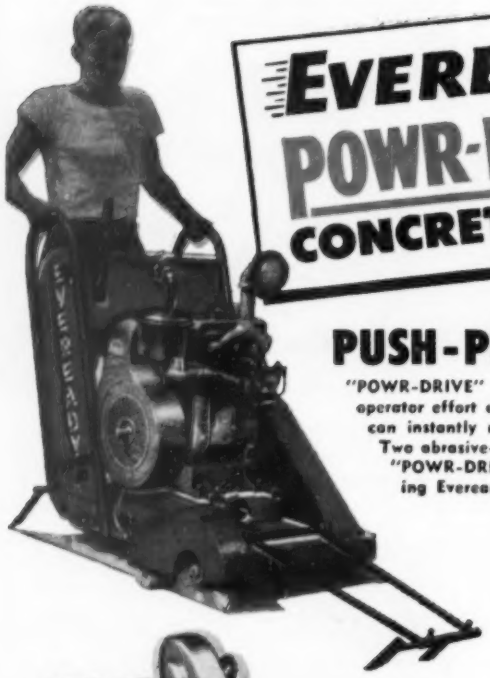

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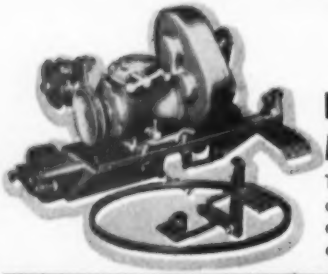

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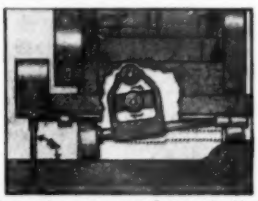

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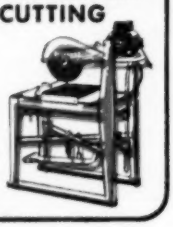

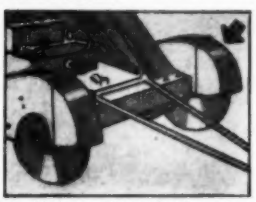

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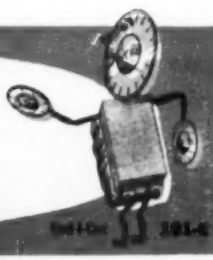

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Help for Contractors in the bidding... and on the job

IN the past 15 to 20 years, the construction industry has kept earth-moving costs down in spite of rising labor and material costs. To do it, construction men have pioneered new earth-moving techniques that have put constantly increasing demands on machinery. That's why in today's tough competitive era a man needs modern equipment that gives him a versatile outfit, easy to move from job to job . . . equipment that enables him to bid successfully and work at a profit.

In an effort to cooperate fully to meet these demands, Allis-Chalmers has for years geared its progress to that of the earthmover himself . . . now offers him completely new designs like the HD-15 . . . a machine that takes advantage of even the most recent developments in tractor application.

The design of the HD-15 also makes full use of new metals, new oils and greases, and the latest manufacturing processes. Existing models were not allowed to restrict Allis-Chalmers engineers . . . so they worked right from the ground up, matching part to part, assembly to assembly, and the entire tractor to its Allied equipment. As a result, the HD-15 offers new standards in ease of operation and service, as well as long-life performance. With outstanding balance characteristics, it handles both mounted and drawn equipment well, provides maximum flexibility for the wide variety of jobs so typical of today's construction work.

And as earth-moving competition gets keener, these design advantages become more and more important to you. We invite you to talk with your nearby Allis-Chalmers dealer to compare values . . . see for yourself how the HD-15 can be a big factor in helping you to win bids, stay on schedule and make a profit.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

HD-15
109 drawbar hp.
27,850 lb.
Six speeds forward to 5.8 mph.
Three reverse speeds to 4.5 mph.

Constant progress in earth-moving methods has been matched by such design advances as this HD-15 and its engine-mounted dozer . . . which were engineered and tested as a unit, right from the start.

This HD-15 Tractor Shovel is a tool which introduced a new era of tractor usefulness . . . let contractors move from job to job easily and do traditional jobs in a better, faster way.

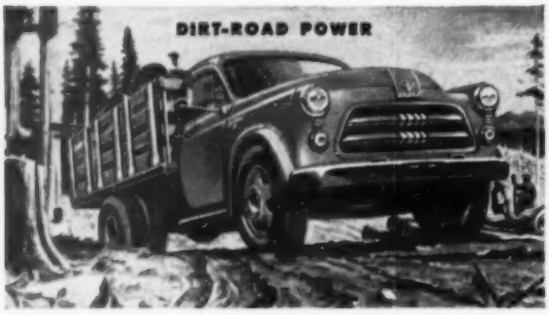
The improvements and refinements of really modern design take on new significance as competition gets keener. Extra yardage handled . . . or lubrication time saved means working more efficiently, more profitably.

NEW DODGE *"JOB-RATED"* TRUCKS OFFER . . .

A better deal for the man at the wheel

A better deal in comfort, visibility! More vision area than in any other leading make. New easy-chair seats with most hiproom. New cab sealing against dust, drafts. New two-tone interior styling.

A better deal in loading height with pick-up and panel floors as low as 22½ inches from the ground . . . knee-high for loading ease. Lower running boards for easier entry. Lower hood for greater visibility.

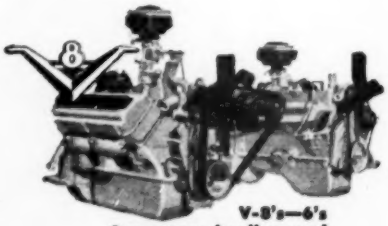


A better deal in power from famous 6's and the most powerful V-8's of all leading trucks. V-8's with efficient hemispherical combustion chambers are available in 1½-, 2-, 2½-ton, standard on 2¾-, 3-, 3½-ton.

A better deal in handling ease! New steering system keeps Dodge ahead of the field with the sharpest turning of any comparable trucks. New power steering available in 4-ton models.

New Dodge *"Job-Rated"* trucks are designed to save the driver time and effort—to give the man at the wheel "a better deal" and make him more efficient. Dodge trucks offer a better deal for the man who pays the bills, too. They're priced with the very lowest; and their low operating costs can save the owner hundreds of dollars during their long lifetime of service.

So, for a better deal on a new truck, see your friendly Dodge dealer. He knows trucks, and he's the kind of a man you can rely on completely. See or phone him today.



V-8's—6's
2 great engine line-ups!

SEE YOUR FRIENDLY DODGE DEALER

NEW DODGE "Job-Rated" TRUCKS

(Advertisement)

Only a Hoe can do Special Excavating Jobs

Hoes are designed for digging below the level on which the machine is standing. However, unlike the dragline and clamshell, that also operate from on top, the Hoe has precision control and a powerful digging action.

A Hoe is free from "wet bottom" difficulties, stands on firm ground and works *away* from the excavation. A properly designed Hoe is a powerful excavator that can dig easily through hard clay, shale or rock. Moreover, because of the fixed length of boom, the dipper can be controlled precisely, resulting in smooth, straight side walls, level bottom and close-limit digging.

Because of these characteristics, the Hoe is ideally suited to certain types of work. Trenching for sewer, water, gas and cross-country pipelines is one of them. These trenches are dug through all types of ground conditions, must have straight side walls and level bottom and frequently are very deep. The precise control of the dipper and the ability to wade through tough digging make a Hoe a "must" on this kind of job.

Hoes are used extensively for excavating residence basements with square corners, level floors—practically eliminating hand trimming. The Hoe can dig the trench for the utility lines, too.

★ Hoes are available in a variety of sizes and capacities to handle a wide range of jobs and uses ranging from digging basements to pipelines. Illustrated is a "TL" Moto-Hoe in the ¾-yard class.

For excavating for footings for larger structures, big capacity Hoes are available to handle a high volume of dirt and still retain the precision of control necessary for this close-limit work.

Two requisites of good Hoe boom design are a gooseneck boom for maximum digging depth and one with a narrow upper section so the operator can see what he is doing.

The bucket should be so designed that it fills easily, even in tough digging, and dumps cleanly.

A Hoe can be a money maker for a contractor. They are available mounted on crawlers or rubber-tired carriers.

(Advertisement)

IF IT'S A JOB FOR A *HOE* LORAIN HAS IT!

There are *some* excavating jobs that *only* a Hoe can handle. There are many others that *can* be dug efficiently with this versatile tool. This powerful, accurate digger can "get you out of a hole" by digging one where no other type of machine can.

Thew-Lorain builds a complete line of Hoe booms for use on all models in the line consisting of seven machine "Series" from ⅜ to 2-yard classes . . . on crawlers, Self-Propelled and Moto-Crane carriers. Lorain Hoe booms range from 14 to 25 feet in length with cutting widths of 24 to 62 inches . . . can dig up to 28 ft. deep. Too, you can interchange your Lorain Hoe with all the other booms available for each model.

If it's a job for a Hoe — big or small — let your Thew-Lorain Distributor prove why it's wise to select a Lorain.

***Here's How* With a Hoe!**

Send for this brand new pictorial book that illustrates jobs best handled by a Hoe. Big pictures of all 7 sizes of Lorains in action. Gives pertinent job data. Illustrates both crawler and rubber-tire models. Every contractor will find this a valuable reference. Write for your copy today.

THE THEW SHOVEL CO., LORAIN, OHIO

Ask your THEW-LORAIN DISTRIBUTOR for facts

Your local Thew-Lorain Distributor can help you in many ways. He will help you determine the right model, mounting and front end from the complete Lorain line. He will show you Lorains in action. He backs up your job with experienced service personnel and parts-in-stock. His facilities can add extra profits to every contract.

SEE THE LORAIN HOE IN ACTION!

THEW LORAIN.

(Advertisement)

WHEN YOU'RE BUILDING ROADS THAT CALL FOR

You'll be glad you bought

The operator can do normal ditching and grading, then high lift the blade to any desired bank-cutting position—including the vertical—without leaving the platform.

Heavily made and reinforced to accommodate the extra power of All-Wheel Drive and All-Wheel Steer, the Bulldozer is an essential for many jobs—a time- and money-saver for dozens of others.

Rugged Requirements *demand* Rugged Performance

ONLY AUSTIN-WESTERN GIVES YOU

that unbeatable combination
ALL-WHEEL DRIVE and ALL-WHEEL STEER

There is no doubt about it. Building and maintaining haul roads, access roads, and fire breaks—plus the many general maintenance jobs in the timber country—is rough, tough work, demanding rough tough machines for top performance, and with an Austin-Western Power Grader you get just that . . . get top performance on primary and secondary roads and highways of every type.

Every part is designed and built to the highest possible standards for long service and efficient heavy-duty performance, and Austin-Western Power Graders have been field tested for work capacity the world over on all types of jobs.

From its brawny, tough frame—with plenty of safety margin where extra strength is needed—to its positive, trouble-free hydraulic system—which does all of the work for you—your Austin-Western Power Grader has the proven stamina and ability to get the job done faster, and at lower over-all cost.

Austin-Western

Power Graders · Motor Sweepers
Road Rollers · Hydraulic Cranes

BALDWIN BLH LIMA-HAMILTON

Construction Equipment Division

Manufactured by
AUSTIN-WESTERN COMPANY
Subsidiary of Baldwin-Lima-Hamilton Corporation
AURORA, ILLINOIS, U.S.A.

EXTRA POWER AND EXTRA MANEUVERABILITY

an A-W Power Grader

Operator Herb Monroe standing beside an Austin-Western Master "99" Power Grader, one of several owned by the Dwyer Lumber Company of Portland, Oregon.

OPERATOR-APPROVED

"...It takes the combination of All-Wheel Drive and All-Wheel Steer to do the work I must do with a motor grader. With my Austin-Western Power Grader, I can work places and at times of the year when an ordinary motor grader would be practically helpless.

Precision Side-Shift also comes in mighty handy many times every day. Because of full hydraulic controls, all operations are easier and I am not exhausted after a full day's work."

Yours truly,

Herb Monroe

Herb Monroe

OWNER-APPROVED

"....About ten years ago we purchased the first Austin-Western Grader from the Columbia Equipment Company. Since that time we have bought two additional Austin-Western Power Graders. Because we have a great many narrow, crooked steep roads in our operations, we have found these graders excellent machines in construction and maintenance of these roads, and they are also outstanding in snow removal. We think the all-wheel drive and all-wheel steer gives added traction and makes it possible to put and hold the blade where you want to do the most work.

The powered front end and power steer are the outstanding features for our type of work and enables us to use these machines in mud, sand and snow removal.

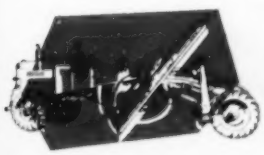
The maintenance cost on Austin-Western Graders has not been excessive. We believe the new heavier model Master 99, which we recently purchased, will be an exceptionally economical machine to use.

We heartily recommend these machines for any and all grader work."

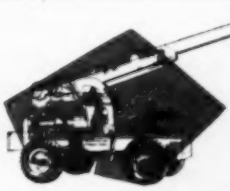
Yours very truly
DWYER LUMBER COMPANY

BY R. F. Dwyer

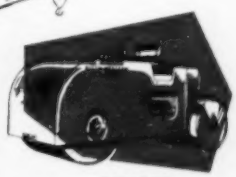
R. F. Dwyer, Pres.



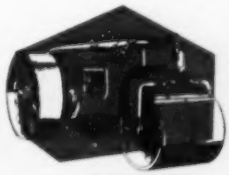
POWER GRADERS



HYDRAULIC CRANES



TANDEM ROLLERS



3-WHEELED ROLLERS

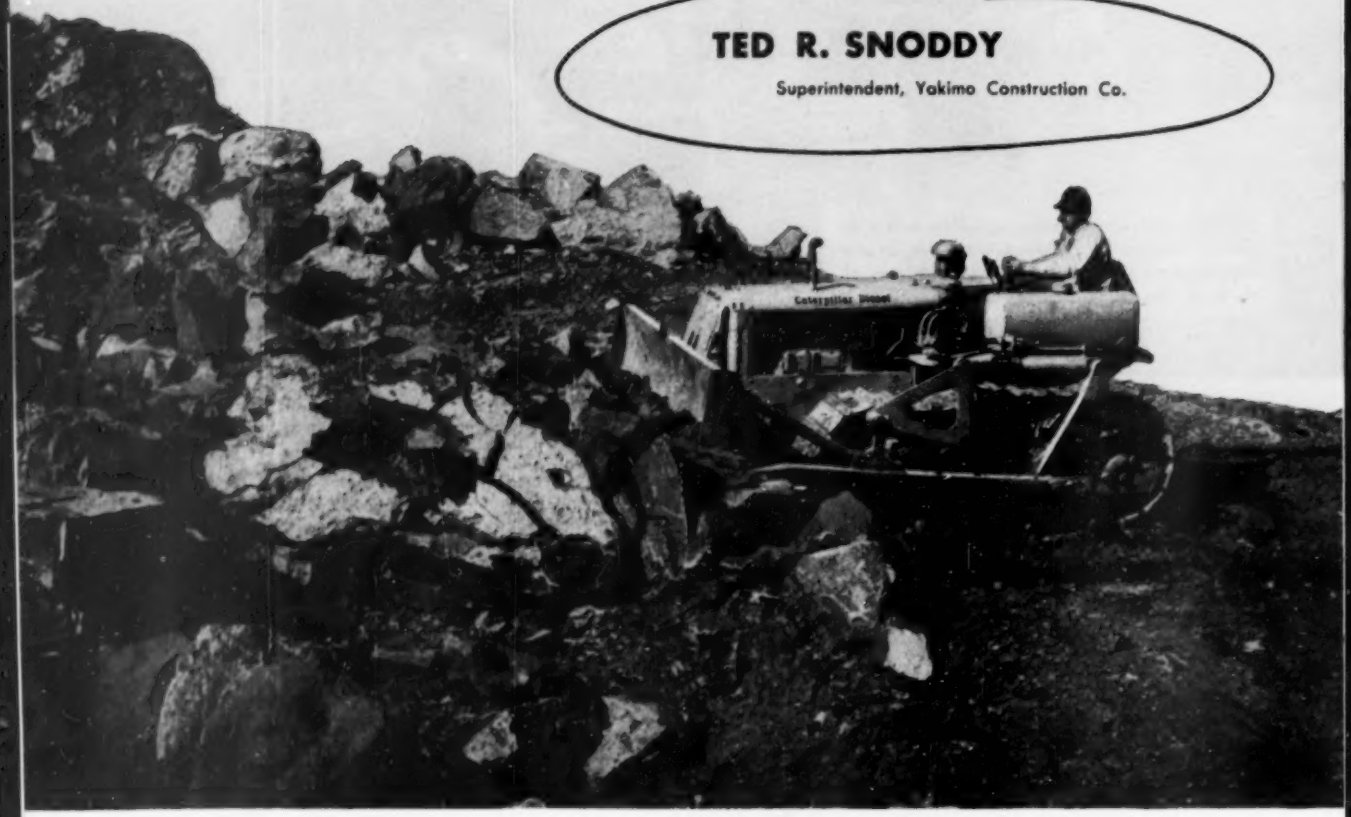
MOTOR SWEEPERS

"When I bought this CAT* D4 Tractor, it took the place of 20 men.

"It saved me about $100 a day on expenses.

"This tractor has paid for itself about four times and no repairs."

TED R. SNODDY
Superintendent, Yakimo Construction Co.



A Caterpillar D4 Tractor equipped with a No. 4S Bulldozer clears rock in the quarry for easy access by trucks. Owned by Yakimo Construction Co., Dallas, Tex., this equipment is working on the Blakely Mt. Dam, Mt. Pine, Ark. The Yakimo Construction Co. has the rock job for the 4,500,000-yard dam.

What else is there to say?

The money-saving performance of this Caterpillar D4 Tractor and No. 4S Bulldozer speaks for itself. Ask your Caterpillar Dealer for a profit-building demonstration on *your* job.

Caterpillar Tractor Co., Peoria, Illinois.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

Roads and Streets in the News

$44,700,000 road budget for Cook County

Cook County, including the greater Chicago area, will have a highway construction and improvement program costing $44,723,000 in 1954, according to the county highway department. Of this amount, $32,550,000 is for super-highways and $12,173,000 for improving nearly 70 miles of the regular existing roadways.

William J. Mortimer, county highway superintendent, has notified his board that the 1954 super-highway projects will exhaust the funds remaining from a $70 million bond issue approved by voters in 1946. Another $100 million is needed soon to carry out expressway construction program. Nearly two-thirds of the money budgeted for super-highways will go for completing the county's share of the Congress Street expressway.

Bridge okayed between N. J. & Pennsylvania pikes

Financing and beginning of construction of the direct link between the New Jersey and Pennsylvania turnpikes will be pushed soon according to Paul L. Trost, chairman of the New Jersey Turnpike Authority. Chief obstacle recently removed was the legal difficulty over a bridge across the Delaware.

The bridge as planned will be located about two miles north of Burlington, New Jersey, and will be a six-lane structure with a tied arch main span of about 500 feet.

Toll road ideas headlined in Illinois

Illinois will have its first toll expressway operating in two years, according to a statement by Evan Howell, chairman of the Illinois Toll Road Commission, in a recent news report. Plans to expedite engineering and the legal work are being pushed, but the commissioners have not as yet revealed the most likely locations for the first toll project.

A separate news report late in the year announced plans for considering the conversion of Skokie Highway (U.S. 41) northwest of Chicago into an expressway leading from the Cook County line in the suburbs northward to the Wisconsin state line, as part of a route leading to Milwaukee. The project eventually would circle Chicago as an outer belt, leading to the Indiana line south of Gary. The proposed location would follow the general route of Illinois 83 known as the Tri-State or Kingery Highway promoted a quarter of a century ago. This toll proposal has sidetracked state plans for continuing Edens Expressway north of Chicago toward Milwaukee as a free limited access expressway.

Other toll road proposals include the original one of a St. Louis-Chicago route, and in the Chicago area various urban expressway links, including a south shore route [R&S Dec. '53], toll plazas in the city's radial expressways now programmed or under construction, and a toll road to O'Hare airport west of the city.

Salditt heads CIMA

The Construction Industry Manufacturers Association, which is also the Manufacturers Division of ARBA, announces the following new officers and directors for 1954:

President: Frederick Salditt, Harnischfeger Corporation; 1st Vice-President, Gail E. Spain, Caterpillar Tractor Company; 2nd Vice-President, Kenneth Lindsay, Iowa Manufacturing Company; Secretary-Treasurer, I. W. Lloyd, Ohio Oil Company.

Executive Vice-President: Harold F. Hess continues in this post, with offices at 135 South La Salle St., Chicago.

New Directors (3 years): B. F. Devine, Chain Belt Company; Kenneth Lindsay, Iowa Manufacturing Co.; W. A. Nugent, Thor Power Tool Co.; Frederick Salditt, Harnischfeger Corporation; Gail E. Spain, Caterpillar Tractor Company; Julien R. Steelman, Koehring Company; F. J. Whelan, Worthington Corporation.

Directors (1956): E. F. Bentley, Detroit Diesel Engine Division, GMC; P. H. Birckhead, Bucyrus-Erie Co.; O. J. Ellertson, Pioneer Engineering Works, Inc.; Arthur A. Levison, Blaw-Knox Equipment Div. of Blaw-Knox Co.; Ray McLean, The Jaeger Machine Co.; Luke E. Smith, "Quick Way" Truck Shovel Co.; W. McK. White, Sr., White Manufacturing Co.

Directors (1955): W. B. Greene, Barber-Greene Co.; I. W. Lloyd, The Ohio Oil Co.; J. G. Miller, The Baker Manufacturing Co.; Robert C. Myers, United States Steel Corp.; Ralph K. Stiles, Austin-Western Co.; Boyd S. Oberlink, Tractor Division, Allis-Chalmers Mfg. Co.; Chauncey B. Smythe, The Thew Shovel Co.

Turnpike spur location OKayed in Pennsylvania

Definite location of a 100-mile spur to the Pennsylvania Turnpike is announced by governor John S. Fine and turnpike commission chairman T. J. Evans. The Northeastern Extension, as it will be called, will extend north from a point on the Delaware River Extension near Philadelphia to the New York line, passing through the Allentown-Bethlehem area. The immediate construction will termi-

How Seattle's Double Decker Looks at Night

★ Looking from the south end of Seattle's new Alaskan Way Viaduct. Fluorescent lights illuminate the lower level roadway carrying southbound traffic, while Westinghouse luminaires on Carco steel poles illuminate the upper deck. Not yet a year old, the viaduct carries 32,000 cars per day

★ Bottleneck eliminated, scenic beauty retained, as new bridge is opened at Delaware Water Gap

nate in the Wilkes-Barre-Scranton area. The route has legislative clearance and construction will be started this spring.

Public works overhaul urged in Baltimore county

A team of efficiency engineers have urged that Baltimore County adopt a 19-point program to improve the efficiency of the county department of public works. The principal recommendation calls for the creation of a new service department "within the department, to function as a centralized public contact and coordinating center for all subdivision projects and to relieve the Planning Commission and the various public-works departments of clerical work." The new agency would handle all the initial work of contacts with private developers, thereby improving the efficiency of procedures, and leading to better results.

Honored by Highway Research Board

★ Prevost Hubbard of The Asphalt Institute, New York City, and Charles R. Waters, district engineer, New York State Department of Public Works, Buffalo, were given the Highway Research Board's annual Roy W. Crum Award for distinguished service to highway engineering. The awards were made at the Board's recent meeting in Washington

New bridge for scenic Delaware Water Gap

The Delaware River Joint Toll Bridge Commission's new $8,276,000 highway bridge spanning the Delaware Water Gap was opened to traffic in December.

The bridge is designed to speed automob'les and trucks into the busy Stroudsburg-Pocono Mountain resort area and to alleviate a dangerous bottleneck of long standing—old U. S. Pennsylvania Route 611 between Portland and Delaware Water Gap borough.

The 2,400-ft. structure actually is two bridges, constructed side by side, carried on 31 granite-faced pedestal T-type piers. Its silhouette is designed to detract as little as possible from the spectacular scenery. Low railings will permit a view of the valley. The toll plaza on the Pennsylvania side accommodates eight lanes of traffic and is illuminated by blue mercury arc lamps. On the New Jersey side a new four-lane highway link costing $4,400,000 provides access. The bridge is engineered to cross the stream at a skew of 28 deg. with the river.

Each of the dual bridges provides a 25-ft., 2-lane roadway and a 5-ft. outside walk. There is a 5½-ft. center mall.

The east bridge consists of 13 simple plate girder spans and a continuous girder over three spans. The simple plate girders are each 147'6" long; the continuous girder has spans of 145'6", 190'0" and 145'6" for a total length of 481 ft. The west bridge, in addition to the foregoing, has a 63-ft. span which compensates for the skew.

Depth of girders, back to back of angles, is 7½ ft. Weight of the inside girders is 31 tons; outside girders, 34 tons. The heaviest section of continuous girder weighs 25 tons.

The "T" type piers supporting the bridges are staggered 64'4 3/16" center to center. They are of reinforced concrete, the columns being round in section, of setback construction. They are faced with cut granite from high water line down. Most piers are supported on H-section steel pilings driven to bedrock.

Bethlehem Steel Company fabricated and erected 5,623 tons of steel for the superstructure. Johnson, Drake and Piper, Inc., of New York, were the prime contractors. J. E. Greiner Company, Baltimore, Md., were consulting engineers to the bridge commission.

● **Evan Howell,** commission member, has been appointed executive director of the Illinois Toll Road Commission, Springfield, Illinois, with starting salary of $15,000.00 a year.

EDITORIAL

Horse and Buggy Specifications

We have it from several authorities that the construction specifications of many state highway departments haven't kept pace with progress. One state hasn't changed its specifications since 1937, several others not since 1941 or 1942, with some of the individual clauses reading more like 1928.

Meantime the contractors have much in the way of new equipment that affects not only their production speed but also their methods of doing things and the possibility for quality work. New developments in vibratory equipment, just to cite one example, raise such questions as the best thickness of base layers for economical placement and control of compaction and uniformity. Or, vibratory equipment isn't mentioned at all or is expressly forbidden.

Asphalt plants and finishers offer another area for improvement in specifications. Everywhere there are new tests and new materials and products, and also new requirements in materials and design, which need proper interpretation in job planning today.

Certain states have made notable progress in bringing their specifications up to date. Oklahoma has overhauled its book, with invited suggestions from contractors. The Pennsylvania department of highways is revising its specifications, and is understood to have entertained suggestions from the contractors associations and adopted some of the ideas advanced. Six states, in all, revised their specifications in 1951 and 1952 and six more in 1953.

Another problem that has come up more than once, is the one of poorly written specifications on consultant managed turnpikes and other projects. A tell-tale sign is the great increase in the use of change orders which often cover just about everything. In one reported instance, a large crib retaining wall built on an eastern highway project failed because the specifications overlooked the important detail of proper backfill material. This type of situation, caused by haste or whatever circumstance, is one reason why the contractor associations are so vociferous about the problem of complying with one set of specs for state roads and another for toll roads in the same state.

Briefly noted . . .

"Off-center laning" is a term that will be heard more and more by highway and street people. It means, in effect, that you use three of the four lanes one way during the morning rush hour into town, and three lanes out-bound in the evening. Many cities are beginning to make increasing use of the device, which, through overhead lights or use of traffic cones, adds extra peak roadway capacity that otherwise would cost very large sums to construct. Accidents are reduced, too, and congestion relieved.

Progress is only beginning to be made on the application of the off-center laning principle on rural arterial sections. The idea offers particularly good possibilities in the easing of week-end and holiday traffic snarls near large cities. The results from adoption of such control in critical areas by various cities and metropolitan highway departments will be watched with interest.

•

Anyone in need of realizing how big this highway business really is, should scan a report from the Pennsylvania Department of Highways. In spending $382 million during the 1951-53 fiscal biennium including $202 million for the 1952-53 fiscal year alone, the highway department will have performed a larger volume in Pennsylvania business than any other organization in the state, public or private.

And by the way, even in this efficiently run state highway operation, the "deducts" took 33.5 per cent, leaving only 66½ cents on the dollar available for construction, reconstruction and resurfacing of state roads. The rest went for maintenance, purchase of land and equipment, township and city aid, administration, etc.

Construction and Good Times

As the new year begins we can all profit by reminding ourselves of the essential role of our industry—the construction industry—in maintaining good times, and in underpinning the nation's industrial growth.

One dollar in eight spent for end products and services by the American people last year was a construction dollar, noted a review by the Associated General Contractors of America. The Association's figure of $46.5 billion for construction broadly included plant maintenance of all kinds, as well as every type of construction.

In noting the rapid rise of highway work this appraisal cited this rise as one of the major factors insuring a 1954 construction industry volume only slightly below the record volume of 1953. It cited the results of off-year elections, the last general election, and the activities of the legislatures, as evidence of the public's willingness to authorize bond financing of needed public works projects, particularly highways, schools, sewer and water facilities.

As long-range favorable factors the Association pointed out the role of construction as a stabilizer of the Nation's business and of the high construction level assured by the need for public works, the expanding population demanding community growth, and ever-unfolding "new horizons" for industry through new developments such as plastics, electronics and atomic energy applications. In the 1949 "recession"—a situation nearly paralleling that of today—construction activity continued to rise while the gross national product dropped off slightly, thereby constituting a bulwark of strength in employment, income spending.

★ Many miles of US 99, are being built for future dualization, with structures built accordingly. Showing a partially constructed section of the Salem by-pass

OREGON PIONEERS . . . With Nation's

Outlining the design and legal background for the new U. S. 99 Oregon. Now under construction for 140 miles, this project represents a type of inter-city highway which, in the opinion of many engineers, must be provided throughout the Nation if motor vehicle transportation is to advance

THE blight of "ribbon development" with its motels, hot dog stands, gas stations and other throttling roadside activities cannot take place on the new U.S. 99 Oregon, now under construction.

Such accident-breeding, traffic-slowing encroachments, together with uncontrolled farm entrances, have been legislated and are being designed *out* of this highway. Sections totaling 140 miles are under construction to full freeway design on new location. Here there will be no access whatever except at traffic interchanges where there will be no cross traffic at grades. All intersecting roads and streets will cross over or under.

The remaining 160 miles between the State's north and south boundaries will eventually all be on new location with controlled access throughout.

The immediate work on U.S. 99 is part of a state-wide program for 1952-1957 which encompasses 800 miles of reconstruction of primary state highways with controlled access at $130 million cost. Of these routes, 140 miles will be to freeway standards, with no access except at interchanges. The chief fact of national interest is not merely that Oregon is accomplishing access control on rural 2 and 4 lane roads, but that it is being done on free roads as part of the state highway system.

Oregon U.S. 99, part of the interstate system—known locally as the Pacific Highway and the state's most important single route, is described here, since this road is receiving the largest allocation of funds. Traffic volume varies from 35,000 daily average near Portland to 3,000 at a few points in the mountains of southern Oregon.

It should be noted that U.S. 99 segments, as with all other road sections of the state, are improved under a priority of need and in accordance with studies to determine the future earning power of the proposed improvement as justification for the improvement. This method* has helped place road design on a sound economic basis, and has enabled the highway department to invest public funds where they will bring the most certain return while best serving the public.

The financing and the far-seeing legal enactments which have made this progress possible will be previewed. But first, to describe some of the design features embodied in the U.S. 99 reconstruction.

1. The road is on new location throughout, with as direct a line as is economically feasible, skirting cities and towns enroute and where possible traversing marginal lands or un-

*See "Oregon Relocation Based on Economic Studies"; Roads and Streets, April, 1953.

★ Controlled access feature conspicuously announced by signs, to educate citizens

★ Scene on section between Divide and Anlauf, built in 1951 to partially controlled access design

Longest Toll-Free Controlled-Access Road

cultivated valley sides. Presently the Pacific Highway is 330 miles from the Washington to the California border. When finally completed the new road will be only 300 miles long.

2. Entry and exit are provided only at interchanges for expressway sections. These are located about 5 to 10 miles apart and are of the directional type. On other sections some additional access will be provided, each section of highway being designed to provide adequate local service with a minimum of access.

3. Flanking service or frontage roads are built where local traffic needs justify, in conjunction with 2-lane as well as 4-lane construction on the main road. Frontage roads are usually 20 ft. wide and are separated from the main roadway by shrubs and trees or other suitable barrier. Once a frontage road is built, the right of direct and uncontrolled access to the main road ceases under the law, and the highway department can connect the frontage road with the main road at any point of its choosing.

4. All state and county cross roads are carried over or under the main

(Continued on page 52. See pages 50 and 51 for construction scenes)

★ North traffic interchange for Salem bypass, U.S. 99 E

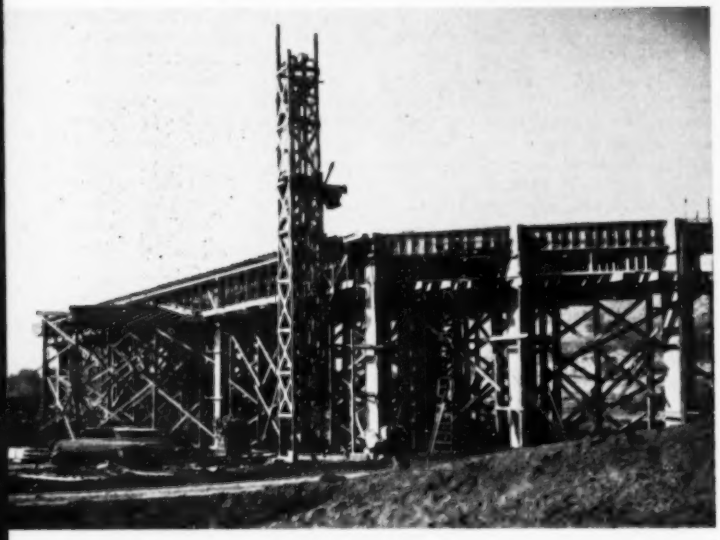
★ Example of frontage or local service road (left), with barrier against uncontrolled entry to main highway (under construction)

★ With White Brothers, contractors, on U. S. 99 contract, Chenowith Park to Deady. Woolbridge Terracabra scraper leveling in cut

. . . on U.S. 99 Oregon

★ On job of Babler Brothers, of Portland, Ore., south of Anlauf. Heavy rock excavation in progress with fleet consisting of Manitowoc shovel with 2½-yd. Esco bucket, 3 Tournarockers, 3 Caterpillar D8's, 2 Caterpillar DW10 scrapers, 1 LeTourneau ripper, 1 Ingersol-Rand Gryo-flo 300 compressor, 2 Gardner-Denver wagon drills. 1,000,000 cu. yd. in 6 miles. Note (above) how scrapers "stole" from shovel by sledding out blasted rock

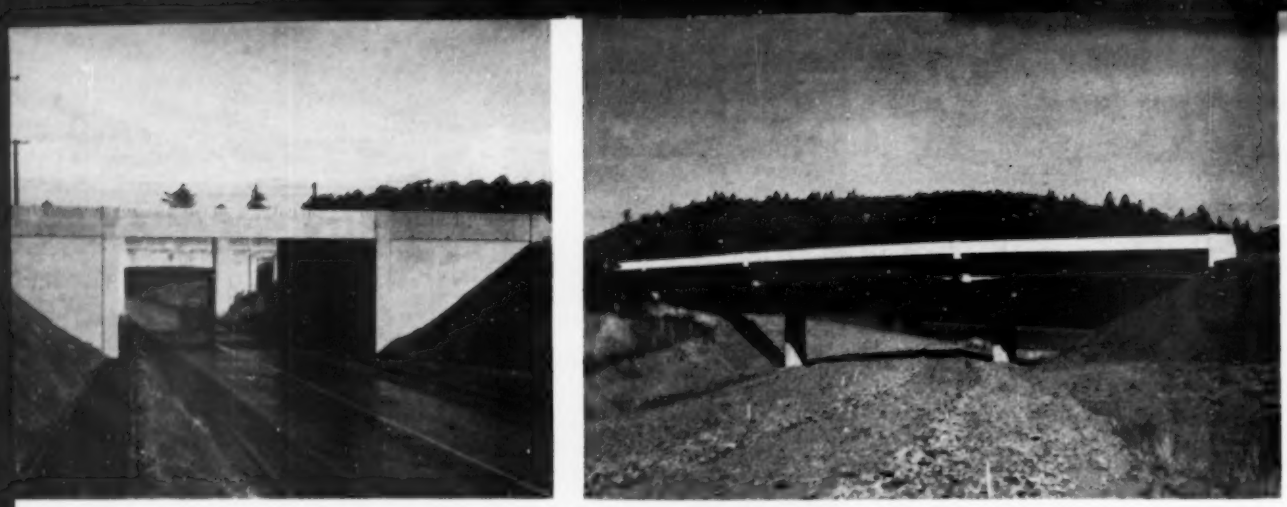
★ Warren Harding of blasting company, talking with Tom Edwards, division engineer, Oregon highway department. Harding Blasting Co. used millisecond delay blasting with Hercules caps for 325,000 cu. yd. rock cut on Deady-to-Shady Point section. Ingersall-Rand wagon drills. Finderburk Construction Co. prime contract.



★ Another look at White Bros. job near Chenowith Park. International TD24 dozing base gravel

★ Overpass for carrying US 99 over Southern Pacific tracks at Yoncalla, Oregon. Todd Building Co., Roseburg. CMC hoist erected for concreting deck

★ Producing aggregates for Warren Northwest job on expressway—Rogers Construction Co., of Portland, erected elaborate plant consisting of Universal, Pioneer, Lippman, Telsmith, Symonds, Blaw-Knox and Caterpillar units (to be described in future issue of Roads and Streets)



★ Typical structure design for carrying local road under expressway. Note bituminous walk, required for suburban location. At right is an example of express roadway bridge utilizing "gallows" type concrete piers

(Continued from page 49)

road—usually over, for economic design. Lesser roads are closed off. The 140 miles of expressway will include 28 interchange points and there will be 29 bridges, 11 railroad grade separations and 92 highway grade separations.

5. Access underpasses are provided for farmers who otherwise would be cut off from access to parts of their lands by the new road. These usually consist of 12 x 12 reinforced concrete boxes. In locating the road, the farm plots along the proposed general line were studied by means of air maps and ownership data obtained from local assessors. Every effort has been made to avoid splitting farms. Where splitting was considered unavoidable, the alternatives of providing an underpass and of purchasing the "fragment" were considered. Nearly always the "fragment" can be sold to the adjacent land owner.

6. Where immediate traffic justifies only two lanes, right of way is being obtained for four lanes and design in all cases planned for ultimate dualization. Right of way for 6 lanes is secured for some portions of the 4 lane expressway sections now under construction. Advance purchase of such rights of way is considered necessary to secure property at minimum cost and to insure future access control.

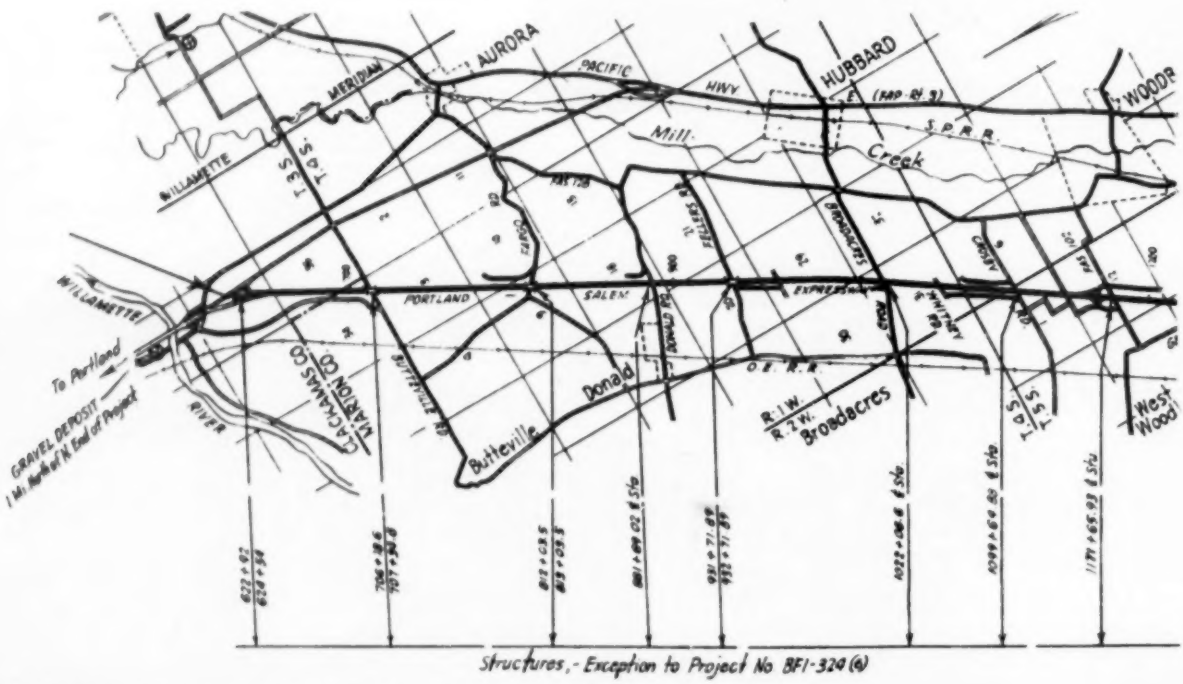
7. The median for rural areas on the express section out of Portland is 100 ft. wide c. to c. of roadways. Urban sections will have a 6-ft. mall with traffic barrier.

8. Right of way will be fenced with high welded-wire type security fence in built-up areas; with farm-type barbed wire elsewhere.

9. Geometric design is in accordance with the highest inter-state standards. Maximum design speed is 70 mph. in open country, 50 mph. in mountains. Grades are held to 5 per cent, except that some 6 per cent grades up to 3,000 ft. in length will be necessary in the mountains. A truck lane is provided for all long grades over 3 per cent. No curve over 4 degree will be built in the 200 miles of route between Portland and Roseburg.

10. The old U.S. 99 roadway will be continued in use as a local road. In some instances parallel sections will become frontage roads.

(Continued on page 56)



★ Showing partial frontage roads through rural area between Portland and Salem

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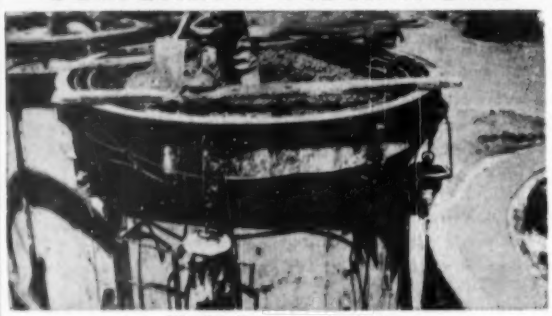

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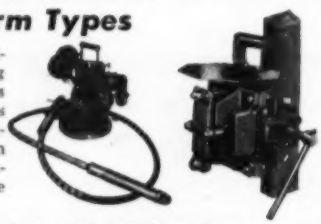

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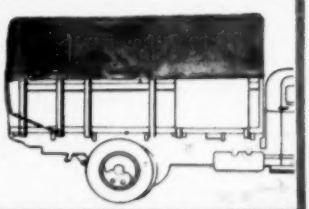

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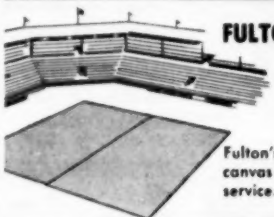

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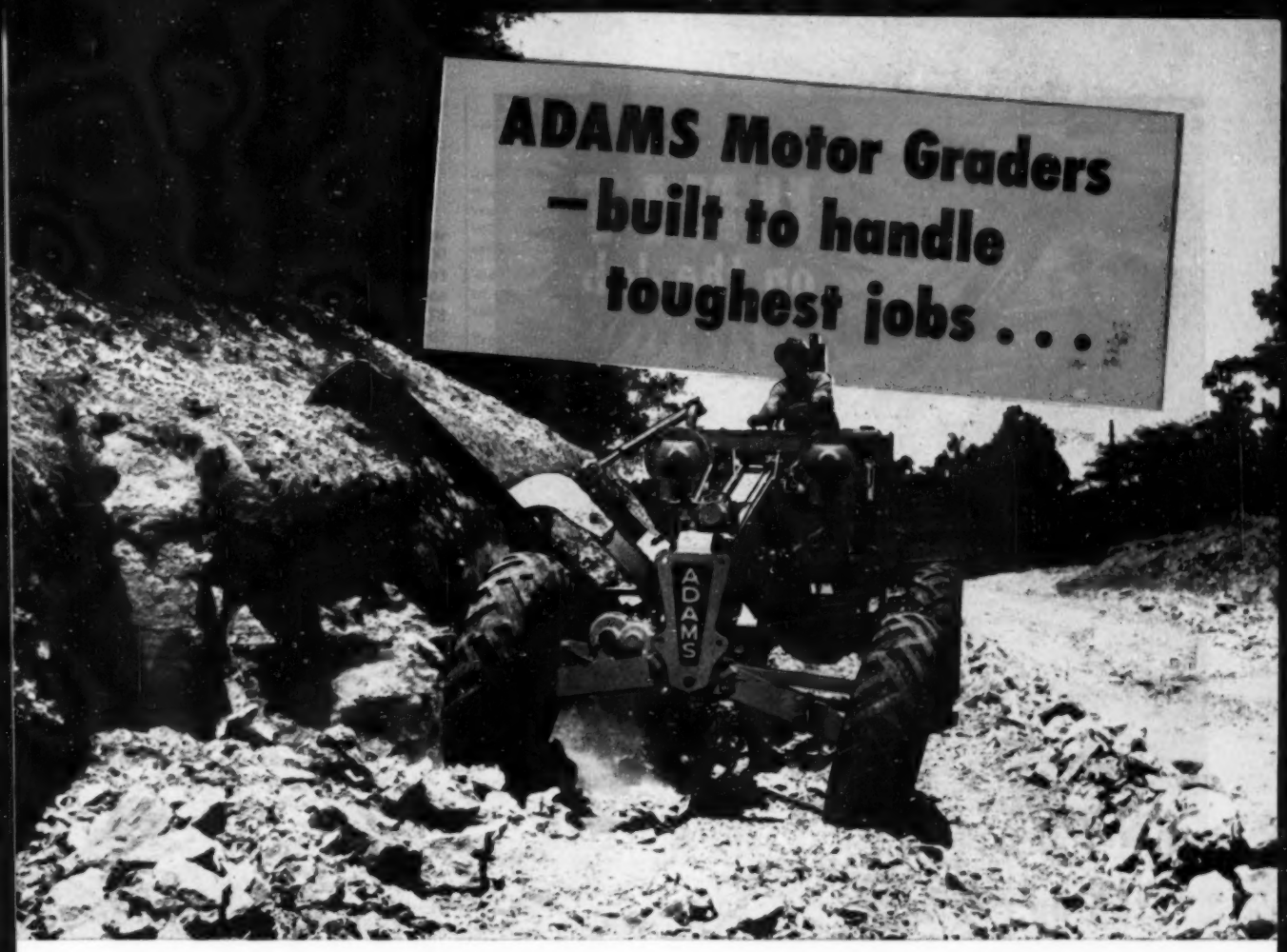

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- **4 REVERSE SPEEDS**—up to 13 mph. Save time on shuttle work.
- **3 CREEPER SPEEDS**—low as ¼ mph. (Optional).
- **RUBBER-MOUNTED ENGINE**—floating power—no vibration transmitted to grader.
- **DUAL BRAKING SYSTEM**—quicker, easier, safer stops, with less effort.
- **FOOT ACCELERATOR**—for easier, safer overland travel.

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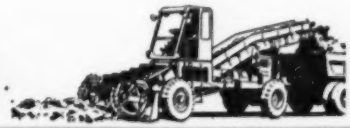
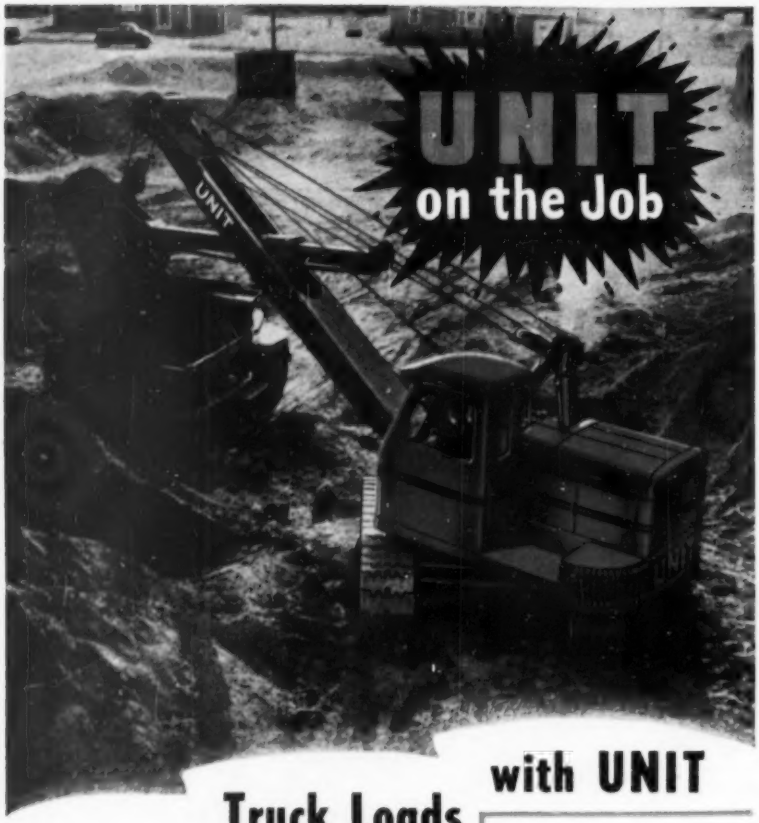


Motor Graders **TravoLoaders** **Pull-Type Graders**



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OREGON PIONEERS

(Continued from page 52)

Sources of Funds

There is being invested in expressway construction on U.S. 99, $44,000,000 for construction and $6,000,000 for rights of way. Of the $50,000,000 total, $31,000,000 is to come from a $72,000,000 bond issue authorized by the State Legislature in 1951 and 1953, $6,000,000 is federal aid and $13,000,000 is from the State's income from gasoline tax, motor vehicle license fees and truck transportation tax.

The rates of interest being paid on the bond moneys average a little less than two per cent.

Oregon's new arterials on new locations are costing an estimated average of $150,000 per mile, about twenty per cent of the cost being for right of way. The 140 miles of full freeway will average about $350,000 per mile for construction, with an additional $70,000 for right of way.

Oregon highway leaders under the regime of R. H. Baldock are firm believers in the necessity of building fully modern highways with the bulk of available road construction funds. Such highways have demonstrated that they bring benefits equal to many times their cost. In Mr. Baldock's opinion the state cannot afford to invest heavily in merely minor improvement of existing highways, which, while immediately cheaper per mile are more costly in the long run. Such a policy, he feels, dissipates engineering talent, wastes money on roads that will ultimately have to be rebuilt, and — more seriously — deprives the people of the safety and economic benefits of fully modern highways.

Only by going to new location, and providing access control under a fresh start away from "ribbon" encroachments, can the highway engineer expect to give road users these full benefits. And only by having "all out" legal machinery and administering it in a climate of public good will and confidence can he hope to apply fully the vital design tool of access control.

Access Control Law

Under the Oregon right of way law enacted in 1947 the highway department can condemn land necessary for highway improvements, and has full jurisdiction over access as heretofore noted. Land is purchased by negotiation with the owner; or, if necessary, through the condemnation procedure.

The first measure of access control legislation in Oregon was enacted in 1939. At that time the State Highway Commission was authorized, when acquiring real property for right of way, to acquire by purchase,

Route of US 99 Oregon

Progress Report on Oregon U. S. 99

Section	Length (Mi.)	Status
Interstate Bridge over Columbia River at Vancouver, Wash. Approved as toll bridge by both state legislatures. Will parallel present 4-lane bridge to form dual 6-lane system. Estimated cost $10,000,000.	1.0	To be awarded late in 1954
West Portland Expressway, from Water Street Underpass on Harbor Drive to connection with Barbur Blvd. near suburban Tigard. Estimated cost $8,000,000.	6.0	Programmed for 2nd 5-year plan (1958-62)
West Portland—Salem Expressway, from point near Tigard to 2 miles north of Salem. 4-lane divided, full expressway. Cost $11,500,000.	37.0	Completion in 1955
Salem Bypass, continuing the above, but on basis, 2-lane to a point 5 miles south of Salem, with 8 interchanges. Cost $2,100,000.	10.0	Completion in 1954
From Salem Bypass southward through Albany to Eugene. 2-lane, except near cities, and with 4-lane R/W.	56.0	2nd 5-year program
Eugene to Goshen. Initiated prior to 1952 Freeway law as suburban section on new location, with interchanges but only partial access control. Dual roadways 44 ft., c. to c. Cost $1,900,000.	4.7	Completed
Goshen to Divide. New location, 2-lane, with 4-lane R/W. Cost $3,900,000.	20.8	Completion in 1955
Divide to Anlauf. Built as 2-lane on new location prior to present Freeway law. Traverses semi-forested hill area. Additional overcrossings planned to eliminate all intersections at grade. Cost $2,000,000.	5.9	Completed
Anlauf to Rice Hill. New location with access control adapted to forested hill country. 2-lanes on 4-lane R/W. Cost $3,350,000.	14.3	Under construction Completion in 1954
Rice Hill to Chenowith Park. Built as a 2-lane, with truck lanes on hills. Mountain area. R/W to be obtained for ultimate dualization.	4.5	Completed in 1941
Chenowith Park to Deady. Seven contractors active on grading during 1954. Example of access control principle applied in sparsely settled mountain area. Cost $2,100,000.	8.8	Completion in 1954
Deady to Shady Point (2 miles south of Roseburg). Same details as for previous section. Cost $5,500,000.	14.8	Completion in 1955
Shady Point to Myrtle Creek. Will eliminate many curves and save five miles of distance. 2-lane on 4-lane R/W. Cost $4,000,000.	11.0	Completion in 1955
Myrtle Creek to Canyonville. Relocation. 2-lane with 4-lane R/W.	9.0	Completion in 1957
Canyonville to Pleasant Valley. Example of modern alignment possible at moderately high cost in canyon and mountain area. 2-lanes, with truck lanes. (Described in Roads and Streets, April, 1953.) Partial access control. Cost $6,000,000.	34.0	Completed in 1951
Pleasant Valley to Rock Point. Reconnaissance in progress for relocation studies. 2-lane with 4-lane R/W.	16.0	2nd 5-year plan
Rock Point to Seven Oaks. 2-lane with 4-lane R/W. Cost $1,800,000.	9.0	Completion in 1954
Seven Oaks to Ashland. 4-lane pavement being constructed on existing alignment. Complete relocation planned for future.	18.0	4-laning of existing route to be completed in 1954

agreement, donation, or condemnation "all right of access" from abutting property to highways "to be constructed, relocated or widened." (Chapter 529, Oregon Laws 1939). In 1947, a second major step was taken with the enactment of the Throughway Act. (Chapter 226, Oregon Laws 1947). A throughway is defined therein as "a highway over, from or to which owners or occupants of abutting land or other persons have no easement of access or only a limited easement of access . . ." The Commission is authorized "to so define a throughway and so regulate, restrict or prohibit access thereto and use thereof as to best serve the traffic for which said highway is intended." To this end, the Commission is authorized to: Divide highways by curbings, stripes or other means; close intersecting county roads with the consent of the county; approve plans for future intersecting county roads; designate points of access with existing city streets when the city has failed to do so within a certain period; close intersecting city streets with the consent of the city; and approve plans for future intersecting city streets. As alternatives to closing intersecting city streets or county roads, the Commission may "make provision for carrying such street or highway or road over or under such throughway or may provide a connection with the throughway by means of a utility or service road to a suitable connection."

The latest major development in access control legislation occurred in 1951 when the legislature declared that no rights of access shall arise between abutting property and a highway thereafter constructed, relocated or reconstructed upon right of way "no part of the width of which has hereofore been acquired for public use as a highway" merely by virtue of the property abutting upon said right of way. (Chapter 587, Oregon Laws 1951). In such cases, however, the Commission shall have the power to "prescribe and define the location, width, nature and extent of any right of access that may be permitted . . ."

The Oregon achievement, in an area of engineering design in which so many states are still lagging, is made possible by a public confidence built up through years of highway department leadership and stability.

★ Reinforced concrete 12 x 12 ft. box, access structure for farmers otherwise cut off from opposite side of expressway

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Loads like this have to be handled infrequently but when they are encountered they can't be permitted to stop operations.

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Meetings Ahead

NATIONAL CRUSHED STONE ASSOCIATION; Annual Convention—Conrad Hilton Hotel, Chicago, Ill.; February 22-24.

AMERICAN CONCRETE INSTITUTE—Annual Meeting, Denver, Colorado, February 22-25.

ANNUAL HIGHWAY ENGINEERING CONFERENCE—University of Colorado, Boulder, Colo.; February 25-26.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC. — Annual Meeting, Statler and Biltmore Hotels, Los Angeles, Calif.; February 26-March 3.

ILLINOIS HIGHWAY ENGINEERING CONFERENCE; 40th Annual Meeting—University of Illinois College of Engineering, Urbana, Illinois; March 2-4.

MISSISSIPPI VALLEY HIGHWAY CONFERENCE—Edgewater Beach Hotel, Chicago, Ill.; March 4-6.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES—30th Annual Meeting, Shoreham Hotel, Washington, D. C.; March 10-12.

PURDUE ROAD SCHOOL—Annual school, Purdue University, Lafayette, Indiana; April 19-22.

Piece of old concrete to be memorialized

Although engineers deal with facts and figures, they are not without sentiment. New Jersey state highway engineers plan to imbed a square of New Jersey's first concrete road in the new pavement to be placed on Route 24 near New Village.

Reconstruction of a one-mile section of this 1912 vintage road is scheduled to begin next spring. At that time the present 18-foot pavement will be resurfaced and widened to 24 feet.

Edward W. Kilpatrick, state highway engineer, was the engineer for Salmon Brothers, the firm which built the old road. He became closely associated with the famous inventor, Thomas A. Edison, who was deeply interested in the project, visiting it many times and offering helpful suggestions.

Tests at the time the road was laid showed the concrete had a compressive strength of 4,500 psi., while in 1950 cores from the same slabs showed 10,000 psi. Built in slabs 12, 18 and 24 ft. in length, the concrete developed longitudinal cracks which permited the entrance of surface water. This fact perlexed Edison, Kilpatrick said, and from this experience developed the practice of incorporating a center joint.

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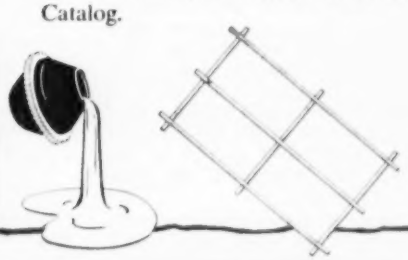

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ARBA Speakers Urge More Federal Aid

See Good Business Year

Highway financing, expressways, contract maintenance, soils and stabilization problems, among topics of varied program at Atlantic City.

LARGER road programs are assured if national leaders who spoke at the recent American Road Builders Association convention at Atlantic City (January 4-7) have their say.

A billion dollars annually taken from foreign aid and spent on the nation's highways was the drastic suggestion of Representative George A. Dondero (Michigan), who is chairman of the House committee on public works.

A vigorous "No" to the idea of the federal government abandoning gas taxes to the states was sounded by Representative J. Harry McGregor (Ohio), chairman, House subcommittee on roads. He joined with Representative Dondero in urging a continuation of the federal-state relationship that has built up our road network so successfully in the past 35 years. Both consider unthinkable any federal move which would undermine the strength of the U.S. Bureau of Public Roads as an agency for coordinating and integrating the state highway programs.

A 10-year highway financing program rather than the customary 2-year appropriation scheme, aggregating at least $40 billion in 10 years —as advocated by ARBA—was endorsed by the Washington leaders.

Expressway Discussion

More use of bond financing for needed urban highways was advocated by Representative George H. Fallon (Md.), who appeared at the Expressways and Finance session. He also suggested that more use could be made of the earnings from existing toll facilities to finance new ones, citing the example of continuation of tolls on the San Francisco Bay crossing to finance a new second crossing now needed. Cities are growing faster than the rest of the country, observed this speaker, and the hope of eliminating congestion lies in the speedier building of divided and limited-access urban expressways. Despite the gain in street expenditures now totaling $828 million annually (construction and maintenance), this investment represents slow progress in view of the fact that urban streets carry half the country's motor vehicle mileage.

Other noteworthy points brought out in this session, presided over by Charles M. Noble, chief engineer, New Jersey Turnpike Authority:

• Take your alderman to other cities and show them the progress being made on urban expressways, was the suggestion of Raleigh Gamble, Milwaukee director of expressways. He took 12 Milwaukee newsmen and city officials on an "eye opening" tour that has paid off in better local understanding of traffic problems and appreciation of the possibilities of modern highways.

• The idea of granting federal aid to toll projects needing additional immediate support other than toll collections, and of placing federal credit back of bonds subordinated to revenue bonds issued to pay part of a project, was advanced by Charles S. Garland, partner in the Baltimore banking firm of Alexander Brown & Sons. Federally backed bonds would be retired after the revenue bonds were paid off.

• Aspects of the Garden State Parkway now under construction in New Jersey were described by Col W. L. Braybooke, assistant chief engineer, New Jersey Highway Authority, who noted that the parkway will serve heavy week-end and seasonal shore outing traffic, and will eventually have additional reversible traffic lanes in certain sections to handle peak flow.

Equipment Utilization

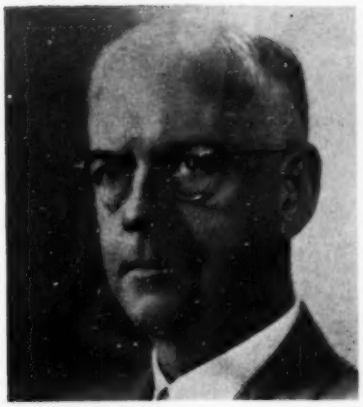
Equipment Obsolescence. The need for contractors and government agencies to keep alert to new equipment developments was stressed by Charles W. Smith, Smith Engineering & Construction Co., Pensacola, Fla. Speaking at a session on equipment he warned that obsolescence can strike quickly as new and better machines become available.

M. B. Garber of Thew Shovel Co. gave an encouraging picture of equipment sales potential for the industry, saying that the market should keep manufacturers at a high operating level. He urged that performance specifications be revised to give contractors a better chance to utilize new equipment. He cited compaction as an example of a procedure hampered often by specifications that do not permit the contractor to devise the most economical methods and thus lower his bid.

Compactors. The rapid development of the 50-ton pneumatic compactor as a roadbuilding tool was discussed by A. O. Williamson, Bros Boiler & Manufacturing Co. Speaking at a session on soils, he stated the belief that air tired rollers will take

★ At the Atlantic City ARBA meeting—Commissioner F. V. du Pont, commissioner of public roads; Lt. Gen. Eugene Reybold, executive vice-president of ARBA; Robert M. Reindollar, consulting engineer, Baltimore, re-elected ARBA president

★ S. Howard Brown, of Brown, Davis & White, Lebanon, Pa., president, ARBA Contractors Division for '54



★ Gen. Donald H. Connolly, president, ARBA Municipal and Airport Division for 1954

★ Jennings Randolph, re-named ARBA treasurer; assistant to president, Capitol Airlines

the place of sheepsfoot rollers on much work in the future. Other speakers at this session voiced similar opinions, including John P. Moss, of Moss-Thornton Construction Co., Leeds, Ala., who told of compaction problems on dams in the south.

What to do about excess soil moisture, prevailing much of the year in many parts of the country, was a problem raised by session leader Earl F. Bennett, of Koppers Co.

Job Accidents. At another session the high cost of highway construction accidents was spotlighted by H. A. Radzikowski, Bureau of Public Roads. He said that the direct cost of such accidents was $18 million in 1953, while indirect costs were an estimated $90 million. Accidents on highway maintenance work cost another $35 million. The accident rate can be cut to one-fifth by a vigorous prevention program, said Mr. Radzikowski, who cited the programs of several progressive states as examples.

Contract Maintenance. Maintenance by contract received attention at the Contractors' session, in which it was revealed that over $100 million is now spent annually on this method of highway upkeep. C. W. McCaughey, deputy director, Ohio department of highways, said his state performed $8,800,000 in highway maintenance and repairs by the contract method last year, permitting performance of other work by state forces with a reduced expansion of personnel.

The need for inter-governmental cooperation to step up the effectiveness of highway planning and speed roadbuilding was discussed by Glen C. Richards, superintendent of public works, city of Detroit. A report of a Highway Research Board advisory committee on this subject, made recently, should be studied by all leaders concerned. He told of the success of the Michigan Good Roads Federation in ending wrangling and unifying the effort of many conflicting agencies, resulting in Michigan's excellent recent road progress. He recommended the ARBA as the ideal agency to do a "Federation" job at the national level.

Engineer Training

Training Need. Report of a survey on what the state highway departments are doing to develop and apply long-range training programs for personnel was presented by C. R. Hanes, Ohio department of highways. Mr. Hanes, who is chairman of the ARBA committee on advancement of highway engineering, reported that while most states have a program of some kind, the objectives and the caliber of the programs vary greatly. He found that the departments need 4,000 additional engineers to supplement the 21,179 presently employed; only three states do not need more engineers. A few states, such as Oregon and Kentucky, report satisfaction with the results of present programs to attract and train engineers. The questionnaire replies emphasized the importance of engineer education and training to meet the expanding highway needs.

Other papers at Atlantic City covered aspects of asphalt emulsion, soil cement stabilization, base construction, experiments with concrete pavement, wire fabric in bituminous pavements, and other roadbed problems. The program also included sessions on helicopter airports, county and local highway problems, roadside construction and maintenance, and the recruitment and placement of highway engineers.

Reindollar Re-Elected

President: Robert M. Reindollar, consulting engineer, Baltimore, Md., was re-named president of the American Road Builders Association for 1954. Other election results:

Vice-Presidents: Charles M. Noble, chief engineer, New Jersey Turnpike Authority; W. G. Pruett, director, Alabama State Highway Department; Julien R. Steelman, president, Koehring Co.; Harmer E. Davis, director, Institute of Transportation and Traffic Engineering, University of California.

Treasurer: Jennings Randolph, assistant to the president, Capitol Airlines.

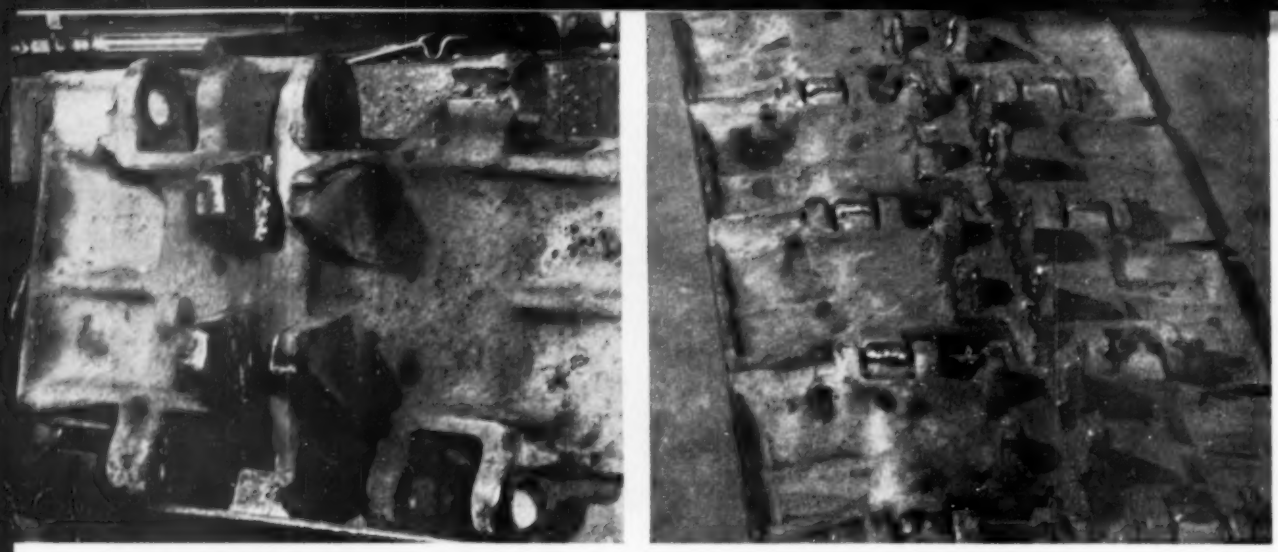
Directors: Robert S. Boger, publisher, Engineering News-Record; M. L. Shadburn, state highway engineer, Georgia; W. L. Chilcote, deputy highway director, Baltimore dept. of public works; Alan N. Buck, superintendent of highways, Macon County, Illinois; Donald O. White, president, American Asphalt Paving Co., Chicago; Boyd S. Oberlink, vice-president, Tractor Division, Allis-Chalmers Manufacturing Co.; Armand E. Keeley, president, Prismo Safety Corporation.

Comprehensive safety manual

A new manual, *U. S. Navy Safety Precautions*, is now being distributed which brings together in one volume a wide variety of safety practices previously scattered throughout a large number of Navy publications, directives and operating instructions. It stems from five years of study by a Safety Precautions Board established in 1948 by the Secretary of the Navy, and has 500 pages in 25 chapters.

The manual is organized functionally, so that precautions are grouped together according to kinds of work done, machines operated, and tools and materials involved. Available from the Superintendent of Documents, Govt. Printing Office, Washington 25, D. C. for $3.

● More than $3.5 billion in highway user tax revenues collected by states since 1924 has been diverted to non-highway purposes, according to a compilation by the National Highway Users Conference.



★ Crawler pad, showing eye with section cut out prior to re-forming, and worn lugs being built up. (Right): Section of track after reworking

Dragline Tracks Reworked with Welding

BUILDING up worn dragline track pads with welding materials is a common shop procedure today. It is done in contractor's overhauling operations, and also in many shops of the state and county highway departments.

Yet this money-saving practice is far from universal, and many a high priced part of this kind is scrapped because no one has established a policy of systematic rebuilding. For this reason Roads and Streets is glad to reproduce here pictures taken in the equipment shop of the Texas Highway Department in District 1. The tracks are for a Lorain dragline that had seen long, hard service.

As described by L. F. Hinkson, District Equipment Supervisor, the worn areas of the lugs were built up, using a general purpose hard surfacing rod.

The eyes were re-formed by cutting out a section of the eye with a torch, heating and re-forming the eye, and then welding the eye back together. For re-forming, the eye was heated and formed around a 1⅞-in. mandrel with a hammer. The mandrel gave a good fit for 1¼-in. pins.

New pins were made from 1¼-in. cold rolled shafting instead of the harder steel that had been used for the original pins. The softer material was used for the pins to allow more wear to be taken up by the pins and to reduce the wear on the eyes of the pads.

The cost of reworking the tracks was $344.57 as compared to a purchase price of approximately $1,950 for a new set of tracks.

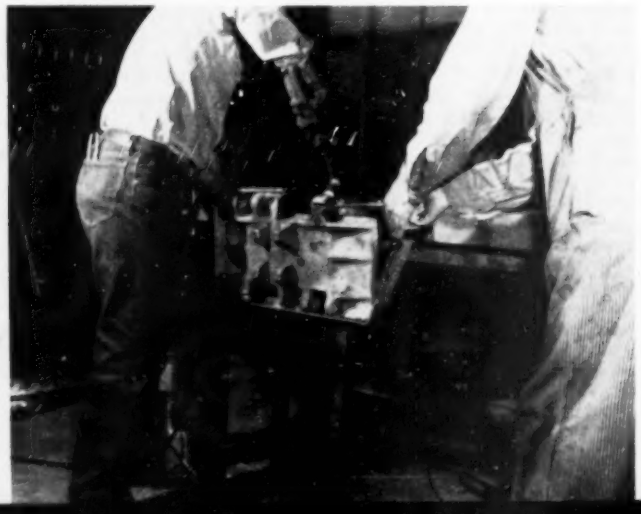
38 bids on one job

A probable record for bids on a single earthmoving project was set in October at Bakersfield College, when 38 contractors bid on the grading of a new 150-acre college site. The job involved 640,000 cu. yd. of excavation.

J. A. Thompson & Son of Inglewood, California, was low bidder at $150,765, his excavation bid being $0.179 per cu. yd. The highest bid was $262,587. Twenty-one bids were less than the engineers' preliminary estimate of $210,000. Plans totaling 71 sets were supplied to interested contractors.

Gorman-Rupp Appointment: Gilbert J. Kirwan has been appointed district representative for the Gorman-Rupp Co., Mansfield, O., with headquarters in Atlanta, Ga.

★ Section of eye is cut out of crawler pad so that it can be re-formed to correct size. Workers at right are re-forming eye to correct size after section has been cut out



GM DIESEL
CASE HISTORY No. 639-51

USER: Geo. M. Brewster & Son, Inc., Bogota, N. J.

INSTALLATION: Four GM Diesel-powered Ingersoll-Rand Gyro-Flo 600 compressors supplying air for 9 I-R 71 wagon drills.

PERFORMANCE: "Completely satisfactory," says operator Tom Malone. Units shown were delivering air to the tools through 1200 to 1600 feet of line--maintaining steady pressure of 100 to 110 psi.

It pays to STANDARDIZE on

GM
GENERAL MOTORS
DIESEL POWER

2400 CUBIC FEET OF AIR PER MINUTE ON NEW YORK THRUWAY ROCK CUT

Geo. M. Brewster & Son now operate a total of 18 General Motors Diesel-powered Gyro-Flo compressors, including this battery of four capable of supplying 2400 cubic feet of air per minute for rock drills on a section of the New York Thruway, near Kingston.

These modern rotary compressors take full advantage of GM Diesel's smoother-running 2-cycle operation to maintain a steady flow of nonpulsating air at 100 psi or better. And compactness of the GM 2-cycle design makes these units smaller and lighter for quick, easy movement from job to job.

This inherent engine design superiority—plus interchangeability of lower-cost parts, readily available through a world-wide GM Diesel service organization—explains why GM Diesel power is a favorite of contractors on so many jobs. Next time you order equipment, it will pay you to specify GM Diesel. Available as original or replacement power in more than 750 different models of equipment. Write us for complete list.

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This amazing new Armstrong Starter is packed with important new features —
It is 50% lighter — smoother acting — easier to service and mount.
The principle is based on the use of friction inside a conventional rope starter cup. Actuated by a cam principle it engages after ¼ inch pull. Eliminates danger of teeth or pawls breaking — permits greater tolerances in mounting. Available with stationary or rotating screen. Competitively priced.

ARMSTRONG BULLDOG STARTER

HERE'S HOW IT WORKS

1. Cam actuated teeth extend to grip inside of standard rope pulley cup.

2. Spring loading retracts teeth when pull stops.

3. Rope pulley available for hand starting in case of emergency.

4. Heart of unit can be incorporated in end products design.

If you make, sell or use products like these, you can reduce weight — improve starting — increase starter life. Chain Saws • Pumps • Power Mowers • Outboard Motors

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An all weather Patcher. Fast, economical, permanent

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The O'HADI PATCHER heats the hole and the mix at the same time.
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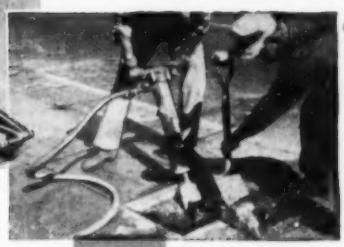
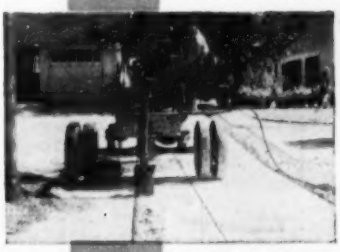


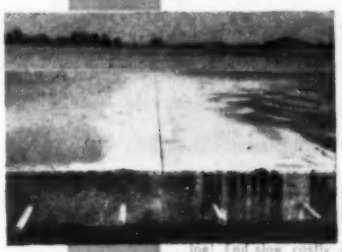
Joe! Stop excessive breakout and high cost

Only minimum replacement material needed and is poured to straight, smooth edges.



Joe! Stop radial fracturing and excessive costs

Sawed lines confine breakout fracturing and speeds removal up to 50%.



Joe! End slow, costly hand forming, spalling

Contraction joints in floors or streets eliminates spalling, 50% less seal and are maintenance-free.

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Sawing Concrete of All Types

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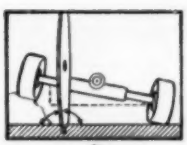

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Three Point Suspension holds the blade straight and true in the cut — **eliminates** binding — drifting — sidewear and friction. Guarantees the **longest possible** blade life!

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Specially developed for low-cost production of transit-mix concrete, this plant is a typical example of Johnson "complete-package" engineering. Plant is fully Johnson-equipped. Every function, from receiving and storage of materials to final weigh-out, is carefully co-ordinated for fast, accurate operation. Here's how it works:

Truck-receiving hopper (A) feeds cement into a screw conveyor, which carries the cement to enclosed bucket elevator (B). 275-bbl.-per-hour elevator fills an all-welded, 520-bbl. storage silo (C), or directs the flow of cement as needed into central compartment of plant bin (D). Aggregates are received at truck-unloading hopper (E). An open, inclined elevator (F) feeds the aggregates into a pivoted distributor, mounted at top of bin. Johnson welded tandem bin provides total overhead storage capacity of 110 cu. yds. for immediate plant use. Bin consists of four 19-yd. aggregate compartments, and a centrally-located, 250-bbl. cement compartment. On batcher floor, below bin, 2 cu. yd. Concentric Aggregate-Cement Batcher, and a Johnson water batcher accurately weigh out materials, and discharge into transit-mix trucks.

For any transit-mix, central-mix or concrete products operation, large or small, it will pay you to check the efficiency of Johnson plants and accessory equipment. See your Johnson distributor soon, or write us.

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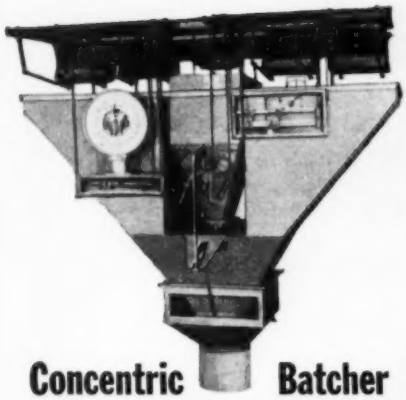
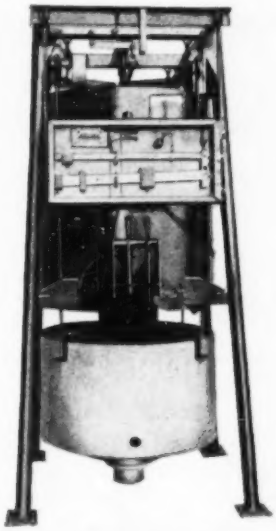
BINS • BATCHERS • RECEIVING HOPPERS • SILOS • ELEVATORS • ELEVATING CHARGERS



Concentric Batcher gives central cement feed

In this exclusive Johnson Concentric Batcher, aggregates are arranged concentrically around cement . . . prevents "gumming". Cement is weighed on separate scale; aggregates are weighed on accumulative dial scale, or on individual beam scales. Sizes: 2 to 6 cu. yds., can be arranged for 2 to 8 aggregates, plus 1 to 4 types of cement. Fully automatic, air-ram operated . . . or semi-automatic . . . or manual controls.



Johnson Water Batcher

increases mix plant efficiency . . . gives close quality control of concrete. Accuracy is not affected by changes in water temperature. Capacities: 120-gal. (1,000 lbs.) for batches up to 3 yds., and 240-gal. (2,000 lbs.) for batches up to 6 yds. Either semi- or fully-automatic types available.

. . CLAMSHELL, CONCRETE BUCKETS

New features on Kwik-Mix 16-S Dandie®

Latest 16-S Dandie concrete mixer, interchangeable side or end discharge, has adjustable double-contact skip shaker, automatic water system, 3-point suspension mounting on heavy coil springs, cast steel drum heads with machined roller paths. Also, exclusive remixing action, and 8-second discharge with tilted Flow-Line Chute. Other models: 3½-S, 6-S, 11-S . . . bituminous, plaster-mortar mixers, power wheelbarrows.

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Rubber-tired Trenchmobile drives job-to-job at 12.6 m.p.h. . . . digs 8 to 16 in. wide, 5 ft. deep, up to 14½ ft. per min. Sloping ladder boom makes vertical set-ins, undercuts sidewalks, curbs, old mains. Other features: hinged crumber, "Tap-In" digging teeth, reversible conveyor, optional backfill blade. Also ask your Parsons distributor about the 2 wheel-type and 3 ladder-type Trenchliners® . . . all full crawler mounted.

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More work-time with Koehring Dumptor®

With more than a ton of strength for every ton of payload capacity, Koehring 6-yard Dumptor withstands severest loading shocks. Sides, end and double-strength bottom are heavily rib-reinforced. Stationary or free-swinging kick-out pan adds another ½" steel plate to heavy-duty bottom. Gravity dump eliminates body hoist maintenance. 1-second dumping speeds haul cycles. Also check Dumptor fast no-turn shuttle hauling.

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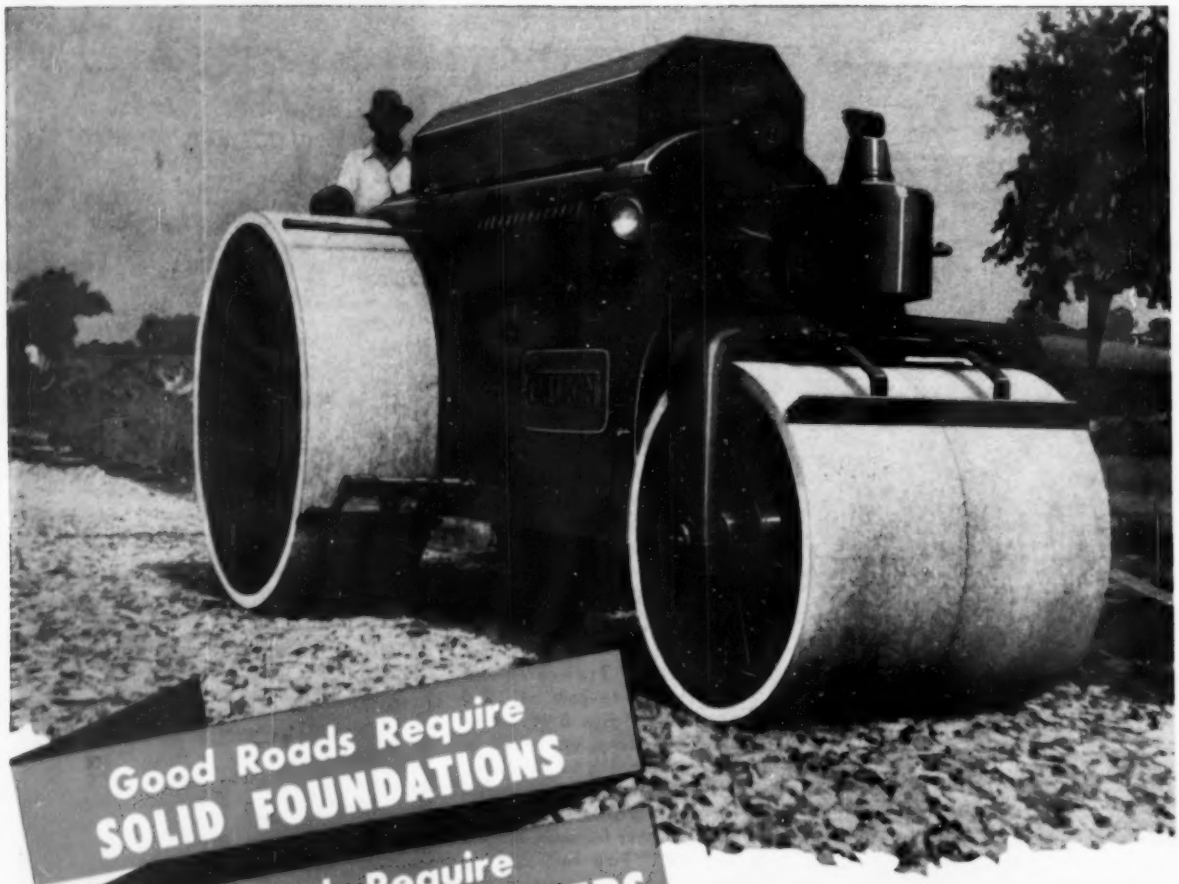

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Bituminous ROADS AND STREETS

Cover Scene

Hundreds of thousands of miles of graveled roads in the Midwest await their turn as stabilization projects. Typifying such roads is this one in Cushing County, Oklahoma. A pair of Allis-Chalmers D motor graders at work on maintenance.

Published by Gillette Publishing Company
29 West Maple Street, Chicago 10, Illinois

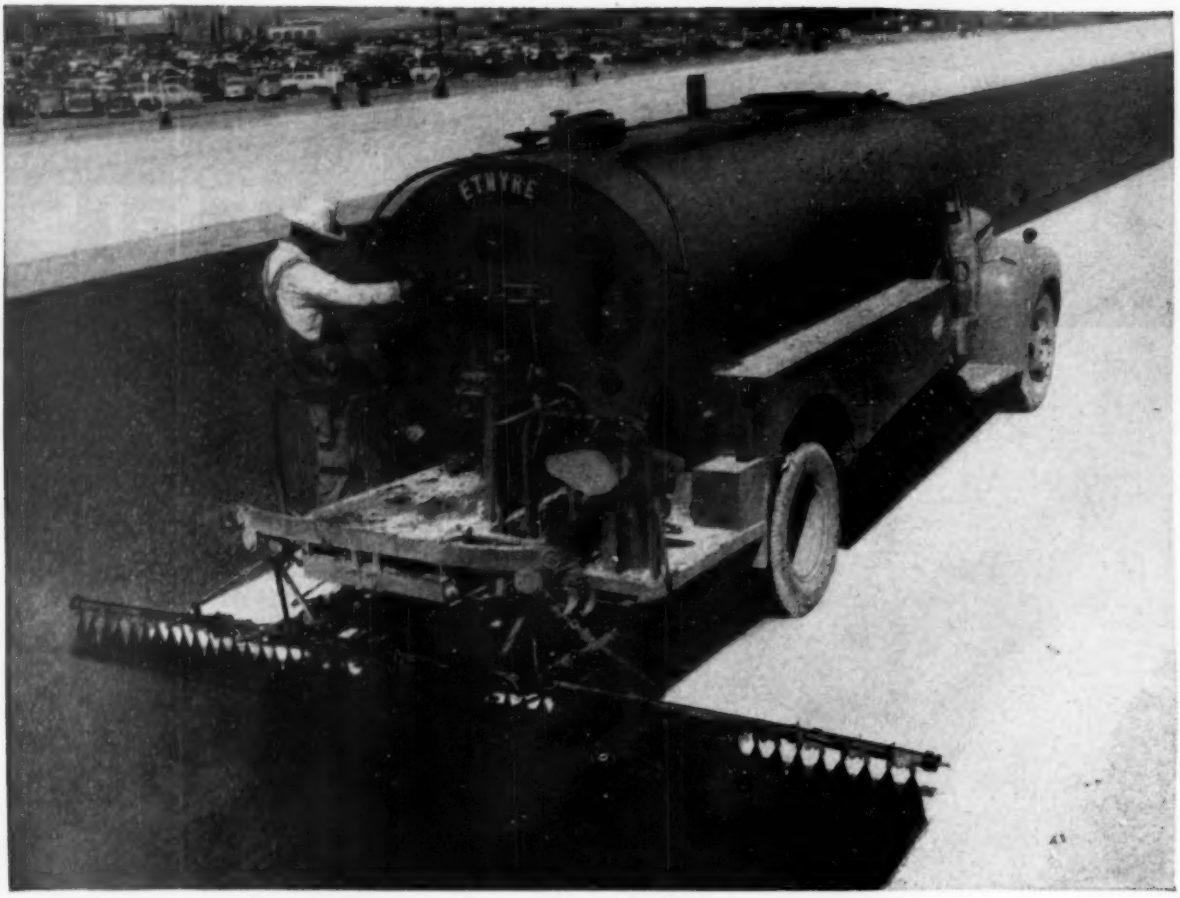
Heater-Planer on Turnpike Spot Maintenance

Wire Mesh Used in Texas Overlay Job

Stability and Pavement Surface Functions (Nevitt)

What's New in Roadbuilding Equipment

FEBRUARY, 1954



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Twenty-four hours to complete the job . . . yet stop work at 3:30 P.M. each day with surface ready for use . . . that's the challenge accepted by Texas Bitulithic Co. of Dallas, Texas.

The contract, calling for speed and dependability, involved reworking the base and finish of a 45,000 square yard parking lot for Chance Vought Aircraft at Grand Prairie, Texas. The job was completed within the time allotted, with all asphalt shot each day covered at 3:30 P.M. for use by the afternoon shift. So smooth was the shooting and so continuous the operation that two spreader boxes were kept busy constantly following the distributor!

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"Black-Topper"

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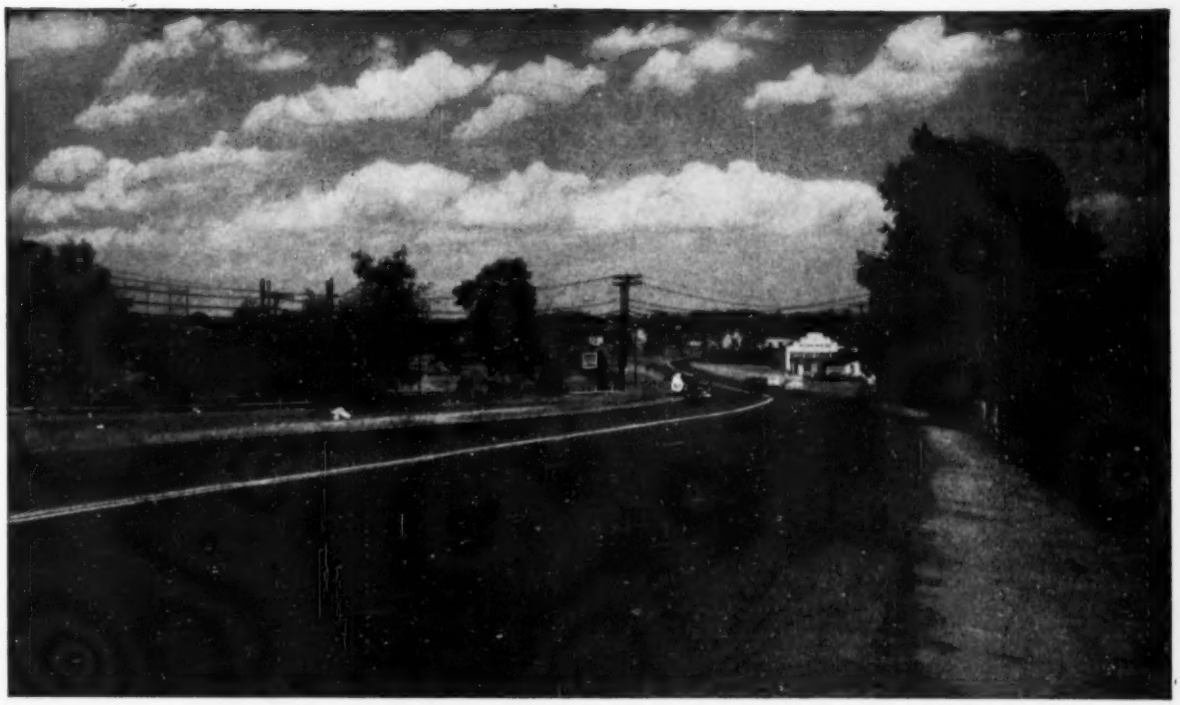

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the Year-Round patching and paving premix

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TARMAC ROAD MATERIALS resist the stripping action of water . . . even withstand the softening effect of gasoline and oil drippings.

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One of the distinct advantages to remember about KOMAC is that it may be stored for a year or more without losing its easy workability. And it *pays* to stockpile KOMAC; as you know, road surfacing materials aren't always available in emergencies. But when you've got KOMAC on hand, you just shovel it into trucks and you're ready to go. It won't stick to shovels, truck beds, or spreading equipment.

Investigate KOMAC premix. Keep a supply of it on hand and you'll have it *when* you need it. For complete information, write today for our free booklet.

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B-G MODEL 840 PLANT

B-G MODEL 845 PLANT

The worldwide acceptance of Barber-Greene Bituminous Mixing Plants is due to their many exclusive advantages that assure profitable, successful operation. For example:

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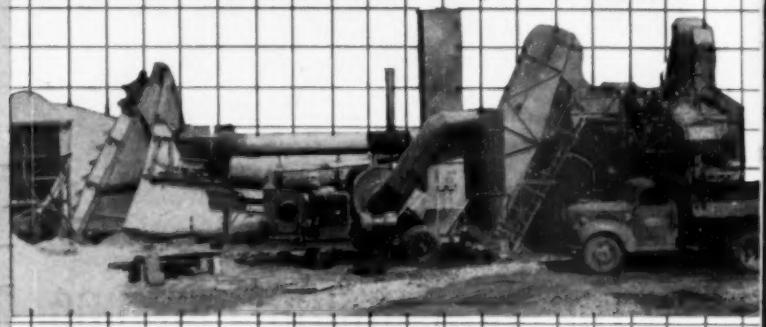
- Accurate, consistent control
- Versatility to produce all classes of mixes economically
- Capacity ranges from 20 to 200 t.p.h.
- Complete equipment—Barber-Greene is the best source for all your bituminous equipment needs, including Feeders, Hoppers, Conveyors, and Finishers.

To profitably meet the great need for bituminous surfacing materials, see your B-G Distributor.



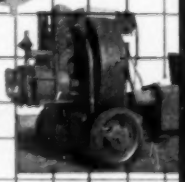
B-G Model 840 Plant

With a capacity of up to 40 t.p.h, this plant is most practical for a broad range of users. Output is high enough for average-sized construction and resurfacing jobs — investment is low enough to assure profitable operation at minimum capacities or for intermittent operation.

B-G Model 845 Plant

For producing in the 60 t.p.h. range. Highly portable. Designed to produce mixes requiring two, three or four-bin gradation, this plant is extremely compact, easy to erect.

THE PLANT CAPACITY YOU



B-G Model 804 Mixall

Mixes as little as a 300-pound batch, as much as 10 t.p.h. For all types of bituminous mixes. Portable.

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OR WRITE BARBER-GREENE COMPANY, AURORA, ILLINOIS, U.S.A.

T. P. H.

with built-in profits

B-G MODEL 848 PLANT

B-G Model 848 Travel Plant

The B-G Travel Plant can produce over 200 t.p.h. of highest quality bituminous or stabilized mixed-in-place material. It mixes in an elevated pugmill, giving full control and eliminating bitumen losses. It has a short mixing cycle, allows the use of heavier bitumens, minimizes wet weather hazards, allows working later — and earlier — in the season.

WANT IN TONS PER HOUR

B-G Model 848 Intermediate Type Plant

Between road mix and "high type" mix bituminous construction, there is a broad range of "intermediate mix" work that is most profitably handled by this plant. With capacities up to 120 tons per hour, this plant can easily be converted to a "high type" plant by adding the B-G gradation unit. Mixer alone may be used in Travel Plant service.

Model 848 Plant with Gradation Control Unit

The addition of the B-G portable four-bin gradation control unit provides a new ease and flexibility in multiple aggregate control. This plant will produce up to 120 t.p.h. of the highest type mixes. Here is the ultimate combination of capacity with uniform high quality and ability to meet the most rigid specifications.

Barber-Greene

234-1

NEW McConnaughay
MULTI-PUG ASPHALT MIXER

REMOVES BOTH MOISTURE AND SOLVENTS

MODEL HTD-500

Prepares Hot or Cold Bituminous Mixtures—¼ Ton Capacity

Designed for economy of operation in the production of bituminous paving mixtures, this new McConnaughay HTD-500 Mixer is large enough (¼ ton capacity) for many resurfacing jobs as well as all types of pavement patching. Working on location, it provides the exact amount of material needed; never too much or too little. It has a low pressure burner directed into the mixing and heating unit through a combustion chamber. This HTD-500 and all McConnaughay HTD models are *the only mixers which effectively remove both moisture and solvents from bituminous mixtures* . . . giving you positive assurance that patches and resurfaced areas will set up hard as soon as the applied mixture cools. Write, wire or 'phone for details and specifications today.

McConnaughay HTD-500 at work on street patching job in Cheyenne, Wyoming.

K. E. McCONNAUGHAY
LAFAYETTE 2, INDIANA

Curb forming machine for asphaltic materials

A new machine has been developed in the North Carolina highway and public works department which will construct a curb without the use of any kind of forms. The machine has been designed to use hot plant-mixed asphalt, but soil cement also has been used successfully. This machine lays curbs quickly and economically, according to a note from the engineers. The curb molded by the machine has a base of 8 in. and a height of 7¼ in. with rounded sides. The formed curb creates a definite barrier and provides a suitable edging for channelizing islands, directing traffic, laying out and indicating parking areas and other uses.

A ton of asphalt mix is required for each 55 lin. ft. Economy is readily seen in that if asphalt is $6 per ton the cost of material would be approximately $60 per mile or about 11c per foot.

The machine travels at the rate of 10 ft. per min. when two men are used to feed asphalt into it. One man is required to operate the machine and usually two men required to shovel asphalt from truck traveling beside it. These three, plus truck driver and possibly a utility man for cleaning up, constitute the needed force. This automatic method of placing curbs should prove a real benefit because of its money and labor saving ability.

The machine was developed by O. K. Stephens of the highway commission and has been used in a considerable amount of work in constructing channelizing islands and forming various other curbs to control right of way, limit driveway entrances, etc.

Urban problems stressed in conference proceedings

Urban transportation is the subject of one large section in the *Proceedings* of the 1953 California Street and Highway Conference. Published by the Institute of Transportation and Traffic Engineering, University of California. For sale by the University Press, Berkeley 4, California. Price: $2.00. (Lithographed, illustrated, 115 pages 8½ x 11, paper bound).

Specialists from different parts of the country contributed papers to the California conference, and participated in a panel discussion. Both the papers and panel discussion are included. Among the contributors: Richard Graves, executive director, League of California Cities; Charles E. DeLeuw, engineer, Chicago; and Edward G. Wetzel, highway planning engineer, the New York Port Authority. Other sections deal with: planning and administration, construction and maintenance, traffic, and education and research.

Simple Procedures Against Asphalt Contamination During Shipment

Penetration and flash tests will be run on asphalt cement shipments during unloading to detect wrong grade or presence of solvents or water—one of several precautions here noted.

THE program of quality control established for asphalt paving on the Garden State Parkway includes special instructions to guard against contamination of tankcar or tank-truck loads of liquid materials during delivery, storage and handling. This subsubject is covered in "Procedure for Quality Control of Asphaltic Material, Bulletin M-2-B," issued recently by the New Jersey Highway Authority.

Directed to all personnel involved, the bulletin covers asphalt cements, cutbacks or emulsions, and miscellaneous materials (cold mix, waterproofing, joint filler, specialty products, etc.)

Source inspection of asphalt cements, cutbacks and emulsions will be administered by Miller-Warden Associates, consulting engineers, from their office at Swarthmore, Pennsylvania.

The general procedure on the routine asphalt cements, cutbacks or emulsions is to inspect these products at the source in the tanks of the refinery or supplier. Individual tankcar or tankwagon inspections will not be made at the refinery routinely, but will be subject to spot checking. Each shipment, however, will be subject to one or two simple control tests in the field to guard against contamination during loading or hauling. In addition, in some cases retain samples will be taken in the field at the point of delivery or use for periodic spot analyses. The application of this general procedure is discussed in greater detail with relation to the individual types of asphaltic materials below.

Asphalt Cements. Refinery inspection of asphalt cements will consist of sampling and testing the individual storage tanks for each lot by one of the following methods:

(a) Arrangement with the New Jersey Highway Testing Laboratory to obtain a copy of their analysis *if* they are routinely testing that particular tank or lot for their own purposes.

(b) Having a consultant representative sample and test or observe the testing of the tank in the refinery's laboratory.

(c) Having an outside commercial testing laboratory (firm of Gulick-Henderson) sample and test the tank.

Acceptance by certified analysis of the refiner may be permissible after approval of the refinery control methods and procedures and after a history of good uniform operation. In any case, the supplier will be required to provide certification that all materials shipped conform with the specification.

One of these agencies (N. J. State Highway Dept., Miller-Warden or Gulick-Henderson) will supply the Supervising Engineer with notification that Lot No. .... representing .... gallons (or pounds) of *(name of material)* contained in Tank No. .... of *(Name of Company)* at *(city,state)* has been approved. The refiner or supplier will provide notification to accompany each individual shipment (tank-wagon or car) giving the number of gallons or pounds shipped and that the material was loaded from Tank No. ..., Lot No. ..., on *(date)* and is certified by the supplier to conform to the specifications.

Refinery inspection is provided for the convenience of the contractors, but in no way relieves them from the responsibility of providing and using materials conforming with the specifications, nor does it in any way relieve the Supervising Engineers from their responsibility to assure that materials used are acceptable.

At the point of delivery (hot mix plant site) the contractors shall provide a laboratory suitable for use by the personnel of the Supervising Engineer. The Supervising Engineer shall take a sample from each truck or car while it is in the process of being unloaded into an on-the-site storage tank having a minimum capacity of 10,000 gal. These samples shall be checked for penetration at 77°F and for Cleveland Open Cup flash. The penetration test will pick up any error that might be due to shipment of wrong grade of material or contamination with another grade of asphalt. The flash test will pick up contamination due to volatile solvents or moisture in the transport or car. In this way trucks may unload without delay at the plant site.

The material accumulated in the storage tank will be tested for penetration and flash and approved by the Supervising Engineer before transfer may be made to the contractor's working tanks. No delivery of asphalt cement may be made directly into a working tank. Spot checks samples will be taken periodically for a complete analysis for check against the refinery analysis.

Common Trouble Source

One point of contamination and trouble that has occurred in the past is to have a truck driver inadvertently unload fuel oil into an asphalt tank or asphalt into a fuel tank. It is, therefore, suggested that the contractor provide large legible signs for each tank to minimize the danger of confusion on the part of the truck driver particularly for night deliveries. It is required that a legible sign be placed on the storage tank plainly and legibly stating that all deliveries of asphalt cement are to be made into that tank.

The refiner or supplier is required to notify the contractor, the Supervising Engineer, and Miller-Warden Associates both at Trenton and at the Swarthmore office any time that a change in crude or change in processing is made that will effect the quality of the asphalt. The refiner is also to supply to the contractor with copies to the same offices typical viscosity (Saybolt Furol Seconds) — temperature curves over the range 210-350°F for the AC cements they supply to the Garden State Parkway.

Cutbacks or Emulsions. Inspection procedures for asphalt cutbacks or emulsions will be essentially the same as that given above for the asphalt cements. Miller-Warden Associates or a designated agency will be responsible for refinery inspection of cutbacks and/or emulsions and for approval of the individual storage tanks or batches within the refinery. Again there will be no routine inspection of each individual tankwagon or tankcar shipment at the refinery, but we plan more stringent statistical control and more

(Continued on page 99)

HEATER-PLANER Used in Resurfacing Turnpike Settled Areas

The following notes were supplied to Roads and Streets by letter from S. C. Funk, Engineer of Maintenance, New Jersey Turnpike Authority, New Brunswick, N. J.

DURING the past Fall the New Jersey Turnpike Authority performed some special resurfacing work in the northern section. The location was between Woodbridge and Elizabeth, in areas where pronounced settlement of the underlying subsoil had taken place, such as at Marsh's Creek where the overload in a sand drain area was removed in eight days during the 1951 construction wind-up instead of the minimum of ninety days, in order to complete the paving and open the Turnpike to traffic.

Three of the areas were on the approaches to structures, one being the north end of Railroad Avenue Viaduct; one, the north approach to the Elizabeth River Bridge; and the other the northern approach to Bellman's Creek, within two miles of the northern terminus of the Turnpike where the approach slabs had settled an unusual amount due to the rush in the completion of the Turnpike.

★ The heater-planer in action on a localized area of the Turnpike

In performing this work the Authority used a heater-planer which is produced and sold by the Asphalt Maintenance Company. This unit was not used in the manner usual for such machines, which is to iron out high spots or wrinkles in the surface. For the most part, we had settlements to contend with, and the high spots as such were more or less conspicuous by their absence. We did, however, use the heater-planer at the ends of each of the five sections and at intermediate points where necessary to get a minimum depth of 1½ in. of surface course.

★ Close-up of heater-planer blade, taking a shaving cut of surface material immediately behind the heater hood

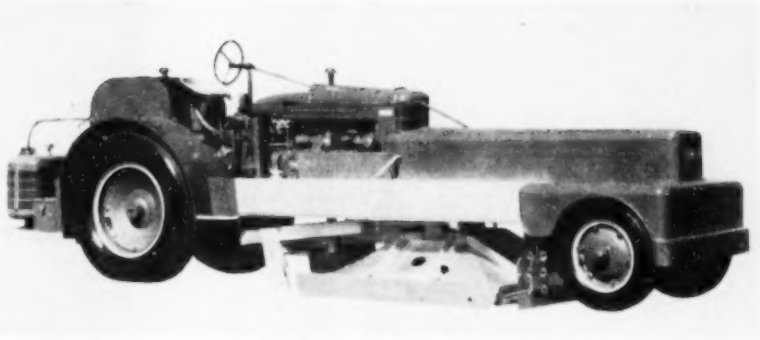
Avoided Feather-Edging

What we were trying to accomplish was to match the pavement on either side of the resurfaced areas for texture and color and to avoid feather-edging. In fact a power saw was used at the ends of all resurfaced areas in order to get a straight butt joint and completely eliminate feather-edging, which is difficult to do with the type of mix used in the Turnpike surface.

In this operation our organization learned much about the technique of resurfacing a high type bituminous concrete, and proved the justification for the use of a heater-planer in order to get a uniform depth of top course material and at the same time avoid

probable injury to the underlying pavement through minimizing of the use of percussion tools.

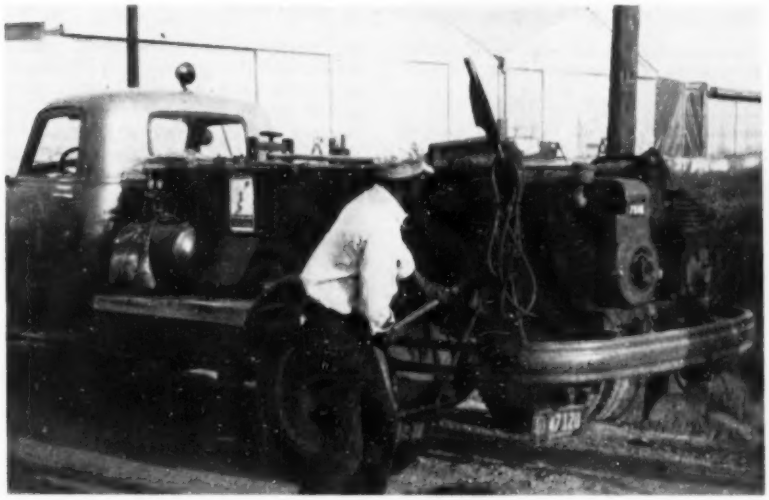
The Turnpike Commissioners were apparently well satisfied with the work performed and, as a result, have authorized additional work of a similar nature as well as the purchase of a heater-planer.



★ The heater-planer unit used on the New Jersey Turnpike

Many kinds of patch materials on one rig

What materials do you need for that pavement patch? Just name them, and this converted truck unit has all of them, and maybe some others besides.



★ Jack-of-all-materials maintenance truck, City of Oakland

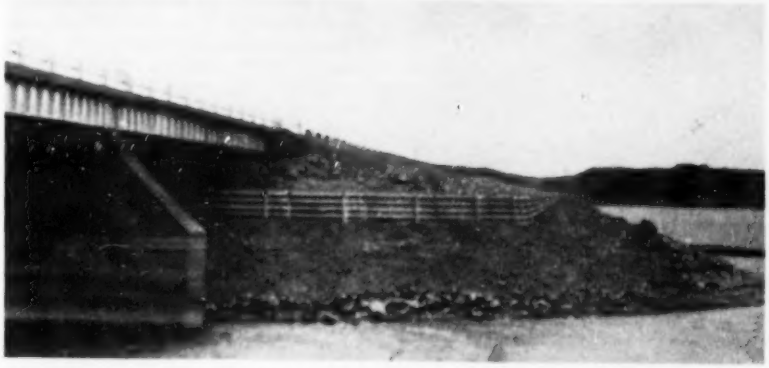
The unit is part of the street maintenance fleet of the Oakland (Calif.) street department. It consists of a 1948 GMC truck chassis equipped with an air compressor, a 38-gal. emulsified asphalt tank, and bins for sand, aggregates and cut-back.

The bins may be opened from either side, and are provided with inverted "V" bottoms so that materials will be continually near the discharge gates. Also note protective rear bumper guard.

Steel bin-wall built on sharp curves

Highway engineers recently had a problem in erecting a 4,000-ft. Armco bin-wall along a causeway in Wyoming. The installation was complicated by the fact that it had to go around several 50-ft. radius curves.

Simple field fabrication was found to be the answer. Individual bins were set approximately 5½ ft. apart at the toes. This space in the front was filled with half stringers cut and punched in the field.

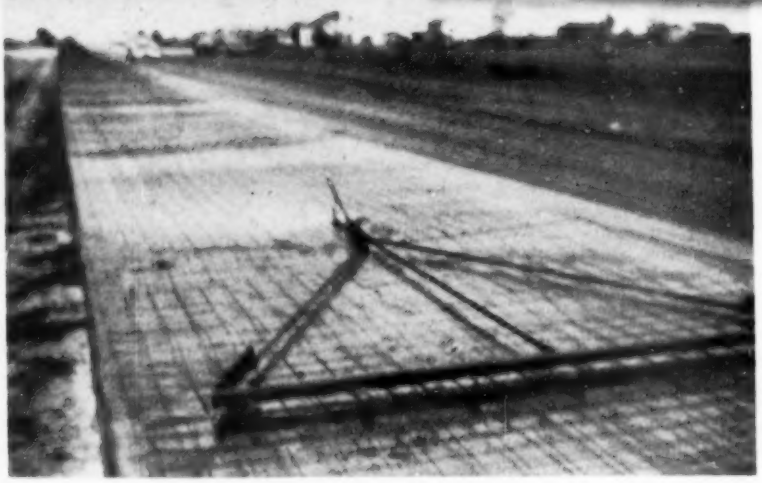


★ Showing details of steel bin-wall along reservoir.

The wall has been under wave action several times since it was installed in the summer of 1953. The state highway department is reported to be well pleased with its appearance and performance, and the contractor is satisfied with his costs.

Marlow Appointments: John L. North has been appointed assistant to the sales manager of Marlow Pumps, Ridgewood, N. J. Maurice C. Bickert, formerly sales engineer for Wallace & Tiernan, has been appointed district engineer for the four state Mid-Atlantic district.

Waite to Handle Bucyrus-Erie Excavators: J. P. Waite, Inc., 3304 West Pierce St., Milwaukee, Wis. now offers sales and service on Bucyrus-Erie ¾ to 4 yd. excavators and cranes in Wisconsin and upper Michigan. The Waite firm has been associated with Bucyrus-Erie since 1948 as distributor for their truck-mounted all-hydraulic Hydrocrane and Hydrohoe which it will continue to carry.



★ Tension device in place, ready to put tension on mesh. Used every 600 ft. (Right): Twisting wires to remove kinks

Wire Mesh in Texas Overlay Job

Resurfacing project near Beaumont, marks third instance where reinforcing was specified to minimize joint and crack reflection through asphaltic concrete overlay.

ONE of the widely prevalent problems in connection with resurfacing concrete pavement with bituminous mixes is that of cracks and joints in the old slab showing up through the resurfacing. Beside marring the riding qualities and complicating the maintenance job, such cracks are sources of moisture infiltration to the subgrade.

★ Example of open joint in existing pavement surface, prior to widening and resurfacing

Here and there over the country recently it has been suggested that distributed reinforcement embedded in the overlay might solve the problem by holding the bituminous mat together. Several test or experimental installations have been reported.

A leader in this effort is the Beaumont district staff of the Texas Highway Department. In 1946 a short section was thus reinforced, in connection with widening and resurfacing work on U. S. 69 in an area of very poor subgrade. This trial [Roads and Streets, December, 1946, p. 57] made use of a few rolls of welded fence wire which happened to be on hand in the district store yard. Then in 1948, encouraged by evidence of some results despite the lightness of the wire, the Beaumont district engineers awarded a 7-mile resurface job incorporating welded wire mesh between the first and second courses of a three-course resurface.

Latest Project Described

On May 19, 1953, mesh was again included in the design for a widening and resurfacing project in the Beaumont district. This job, now completed, consisted of 9½ miles of heavily traveled route U. S. 69-96-287. The project included widening of the existing 9-6-9 parabolic cross-section concrete pavement to 24 ft. by adding a 4-ft. reinforced strip on one side. This strip, 9 in. thick at the outer edge, graduates to 15 in. thickness at the existing pavement edge, and underhangs the old slab 4 in.

The resurface consisted of three full-width courses. First a leveling course was machine-laid consisting of 100 lb. per sq. yd. of Texas Type E (sheet alphabet mix). On this course wire mesh reinforcement consisting of 6 x 6 in. spaced No. 10 welded wire weighing 1.44 lb. per sq. yd. was placed on the first course. A second course of plant mix, Texas Type D, ¾-in. max. was machine layed with an Adnun Model QXC finisher, and rolled, and a third course of Type D machine layed and rolled to complete the job. The two Type D courses aggregated 290 lb. per sq. yd., and the three courses equalled about 3¾-in. combined thickness.

In weighing the economics of the 1953 project, the engineers reviewed detailed bids for the 1948 project and found that the mesh was equivalent in cost to about ⅝ in. thickness of asphaltic concrete.

In designing the recent project, the engineers decided to substitute mesh

for additional thickness as a means of further experimentation under normal traffic. The job was bid at $368,-090 by Trotti & Thompson, contractors, of Beaumont, including shoulders and incidentals. The mesh-vs.-mat arithmetic, which again figured out to show an equivalent value of about ⅝ in. of mat thickness for the mesh used, was based on the following quantities and bid prices.

1,097 tons asphaltic cement (85-100 pen)	@	27.90
14,925 tons Type D surface course mix aggregate..	@	7.00
3,345 tons Type E sheet asphalt mix aggregate.	@	6.50
19,377 gal. tack coat.....	@	0.18
73,110 sq. yd. wire mesh (6 x 6, No. 10.....	@	0.22

The preliminary mix design included 4.6 per cent asphalt content by weight. On this basis, the cost of the overlay was calculated to be $6.678 for aggregate and $1.28 for asphalt per ton of mix, or $0.418 per inch thickness per square yard. Since the mesh was bid at $0.22 per sq. yd., the mesh was equivalent in cost to .526 in. of overlay thickness, or only slightly under the ⅝-in. figure found for the 1948 project.

Experience in this district had shown that the heavier the total overlay thickness, the less readily and completely the joints and cracks in the base pavement showed through.

Welded wire fabric used in airport paving

First known use of welded wire fabric in asphalt runway topping was made late in 1953 by Indianapolis Airport Manager P. H. Roettger. Application of the fabric was unique in that it was rolled out along the transverse expansion joints between slabs of the existing concrete runway. (Welded wire fabric is usually laid in sheets, longitudinally in the direction of the paver.)

Mr. Roettger, explaining this unusual treatment, said: "I wanted to resurface the runway and eliminate joint maintenance. I think the 5-ft. width of welded wire fabric over the transverse joints in the older pavement, many 1½ in. wide, will maintain the continuity of the asphalt and prevent cracks from striking through the new surfacing."

Over 2500 ft. of the heavily used main runway was resurfaced, with welded wire fabric going over most of the existing expansion joints. For purposes of later comparison, however, the fabric was omitted from some joints. The joints have been marked by stakes in the adjacent grass indicating presence or absence of the mesh.

The runway was originally paved in 1931 with 6 in. portland cement concrete, reinforced with welded wire

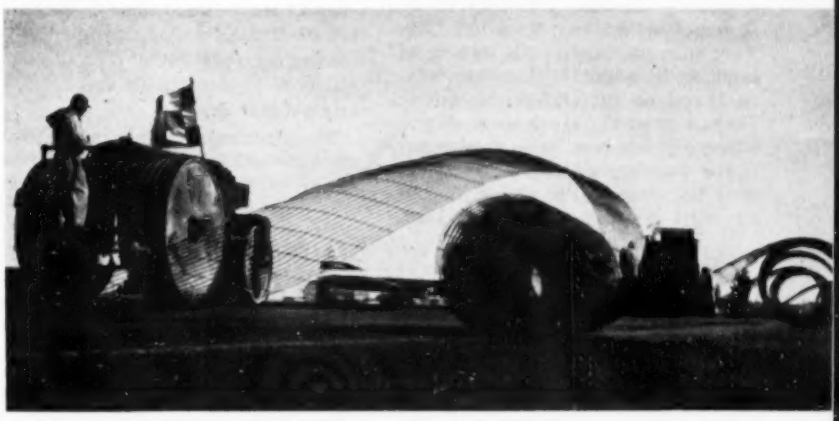
★ Weight bar used to hold mesh down is being placed under finisher. (Right): Finisher in place ready to begin placing Type D mix

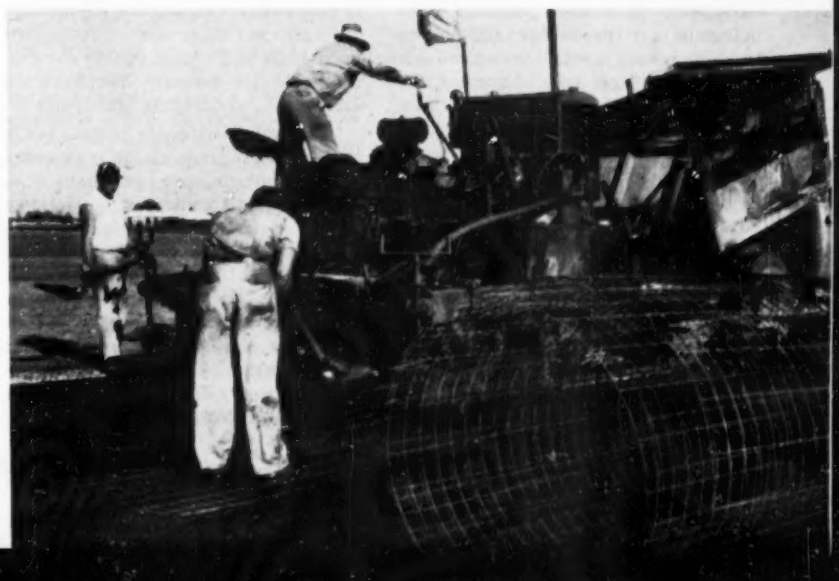
fabric. Only 120 sq. yd. of this pavement had to be replaced in preparation for the re-surfacing, and of this, two sections were found in which the fabric had been omitted entirely, by accident or design. (The original welded wire fabric reinforced pavement, designed for 20,000 lb. gross load factors, ample for the lighter planes of the '30's, in general had withstood successfully the much greater loads, up to the Constellation's 94,000 lb.)

After the preliminary preparation of the base, the first course, one and

(Continued on page 81)

★ Scenes during placement of first and second course overlay at Indianapolis Airport. (Above): Paver has first laid base course, followed by roller. (Below): Fabric spread over a side base joint and second overlay course being laid





VIEWS AND COMMENTS

By H. G. Nevitt

Basic Surfacing Requirements

In a previous discussion, entitled "Just What Is Stability?", we pointed out that the design of a surfacing must assure that its functional requirements be met. We further intimated that the literature did not seem to contain much discussion as to just what the fundamental requirements were. To initiate the correction of this lack, as well as provide some thought on the subject, we will briefly venture our views.

The first requirement of the surface might be given as the ability to withstand directly the action of traffic. Ordinarily this would be described as the ability to resist either ravelling or rutting. Actually the requirement is somewhat greater than this. The surface must maintain its structural integrity as a unit. It therefore must not ravel or rut and shove; but it likewise must not break away due to either brittleness or lack of adhesion to the foundation below it, or otherwise fail despite the ability of the structure as a whole to carry the load.

Should Add Load Capacity

The second requirement is that it function as an element of the total structure, performing its portion of the total load bearing action. This functional requirement has been given almost negligible consideration in the literature, discussions among technologists, or the design techniques most commonly used. It is not enough that the surface avoid failure from some breakdown in its area. It is part of the total structure, and for best engineering should contribute as much as possible to that structure in the way of load carrying characteristics. This contribution can be appreciable and it should be given a great deal of consideration.

The effect that a good surfacing as compared to a bad one can have on the total load carrying capacity of the structure was rather spectacularly exhibited in some of the Vicksburg tests which were the original basis of the present Corps of Engineers' design procedure. Failure to take advantage of the load bearing contribution possible from the surface implies wasteful design and should not in the usual case be tolerated.

The third function of the surface is to provide proper operating characteristics for the vehicles using the road. Essentially this implies good initial skid resistance, reasonable maintenance of such condition, likewise luminosity where obtainable, and water-proofing and other desirable points which have been thoroughly discussed in the more comprehensive studies of sealcoating. However, such characteristics are ordinarily best obtained through a supplementary sealcoating operation rather than through attempts to incorporate them in the original mat design.

The intrinsic requirements for strength and for surface characteristics are sufficiently contradictory that only occasionally can they be met by the mix itself. Where very hard, durable, angular aggregate is available it may be possible to create fairly permanent skid resistance and other desirable surface characteristics in the mat; but in the usual case the optimum design provides a mat which best meets the structural needs, and takes care of these desired surface characteristics through a supplementary sealcoat after the structure has been built and tested out to see that it meets its primary requirements from the load carrying standpoint.

The first function is rather easily provided in a great majority of cases. The essentials are primarily the proper asphalt content and frictional resistance in the mix. This latter can be tested by the triaxial method or some simplified, although empirical form of it, such as the Hveem stabilometer. The criteria by these or other test techniques are simple and can ordinarily be met by a little care. Only with very difficult aggregates or due to side effects such as stripping do we today encounter roads which tend to give difficulty on this point, despite occasional examples of minor trouble due to lack of care in the design.

Since the third function is generally taken care of separately by a sealcoat we merely need to also make sure of the second functional requirements to get a good design. Here is where attention is needed and has not been given to the extent indicated as desirable. A brief examination of the situation will indicate requirements.

Contributes Bending Resistance

In what way does the surfacing perform as part of the total structure? It, of course, provides some shear resistance and similar just as does the base. Primarily, however, it provides negative bending support to prevent upthrust from the foundation or subgrade due to lateral (and hence ultimately vertical) components resulting from either shear or arch action.

In simpler language, since usual aggregates under highway loads fail by lateral displacement under the load, and this in turn must result in vertical or upward displacement adjacent to the load, the primary function of the bituminous surface can and should be to provide sufficient resistance to this upward action to greatly add to the surcharge effect on the foundation and therefore increase its resisting ability. Obviously, this implies resistance in bending, with the surface acting as the tension element, over the areas where uplift tends to occur. Hveem, in his design formula put out a year or two ago, recognized this and to take care of it brought in the cohesiometer value of the structure in his formula. Since the formula and the values used as well as the cohesiometer test itself all have an empirical background, we are not able to pass on the degree of accuracy to which this tendency is reflected. Nevertheless the principle is clearly recognized and this approach deserves due credit therefor.

★ Rogers trailers used to move dredge components to the Delaware River

★ Roger Sherman of East Hartford moving heavy factory machinery

Obviously this point deserves more attention in both theory and practice. In the theory, some effort to establish a measure of the characteristic and tie it into the design technique is an evident objective. In practice highway engineers can give some thought to whether it gives the greatest flexural resistance. A little imagination and intuitive analysis, rather than elaborate mathematics, will serve to indicate to most of us that some surfaces do not have much quality from this standpoint whereas others function very well. We can perhaps describe it to the practical man by the use of the term "tough." A surfacing which is tough, does not crack easily but flexes under load, should be a better structure. We of course need to make certain that we are not confusing toughness with other properties, but the moral is easy to see.

Everyone concerned with highway construction—not only the designer—needs a clearer picture of just what the surface can and should do; likewise how well it performs these functions. Too many "crippled" surfaces are being built—or maintained—today. They may get by, carrying the traffic in some sort of fashion, but they don't do the full job which can and should be expected of them. The full performance costs little or no more than this partial functioning. Not to get it reflects poor management; not to realize its lack, poor engineering.

Welded wire fabric

(Continued from page 79)

a quarter inches thick, of coated aggregates, heated to a 180 to 240 deg. F. range, was laid down and rolled over the entire width of the runway for the length of the project.

Next, the fabric, of 10 gauge wire spaced 3 in. longitudinally and 6 in. transcersely in 100 ft. rolls, 5 ft. wide, was placed over the now covered expansion joints (marked by stakes in the grass), with a 2-ft. clearance on either side of the 104-ft. runway. Wire staples were used to hold the fabric in place at the start of each roll, with only enough fabric unrolled for a single pass of the paver. As each succeeding pass was made, more fabric was unrolled, and shovelfuls of asphalt thrown onto the fabric in advance of the Barber-Greene paver to help keep the wire in place. Workers also stood on free ends of the mesh when necessary to keep it from catching in the paver. With these precautions, no trouble was encountered in the paving-over-fabric operation.

The second course of coated aggregates, also 1¼-in. thick, was then rolled and finished off with Seal Cote at 0.2 gal. per sq. yd., and limestone chips at 15 lb. per sq. yd. The chips, heated to 215 deg., "fried in" to the surface to form a hard, tough coating.

Initial inspection of the busy Indianapolis runway (up to 600 plane movements daily), according to the Wire Reinforcement Institute, indicates that cracks are forming only over the transverse joints *not* covered with fabric, and in this connection, Mr. Roettger expects later to seek definite conclusions about its effectiveness.

Data and results of other re-surfacing projects using welded wire fabric in asphaltic concrete can be obtained by writing Wire Reinforcement Institute, Inc., National Press Building, Washington, D. C.

Tide and trailers move big dredge

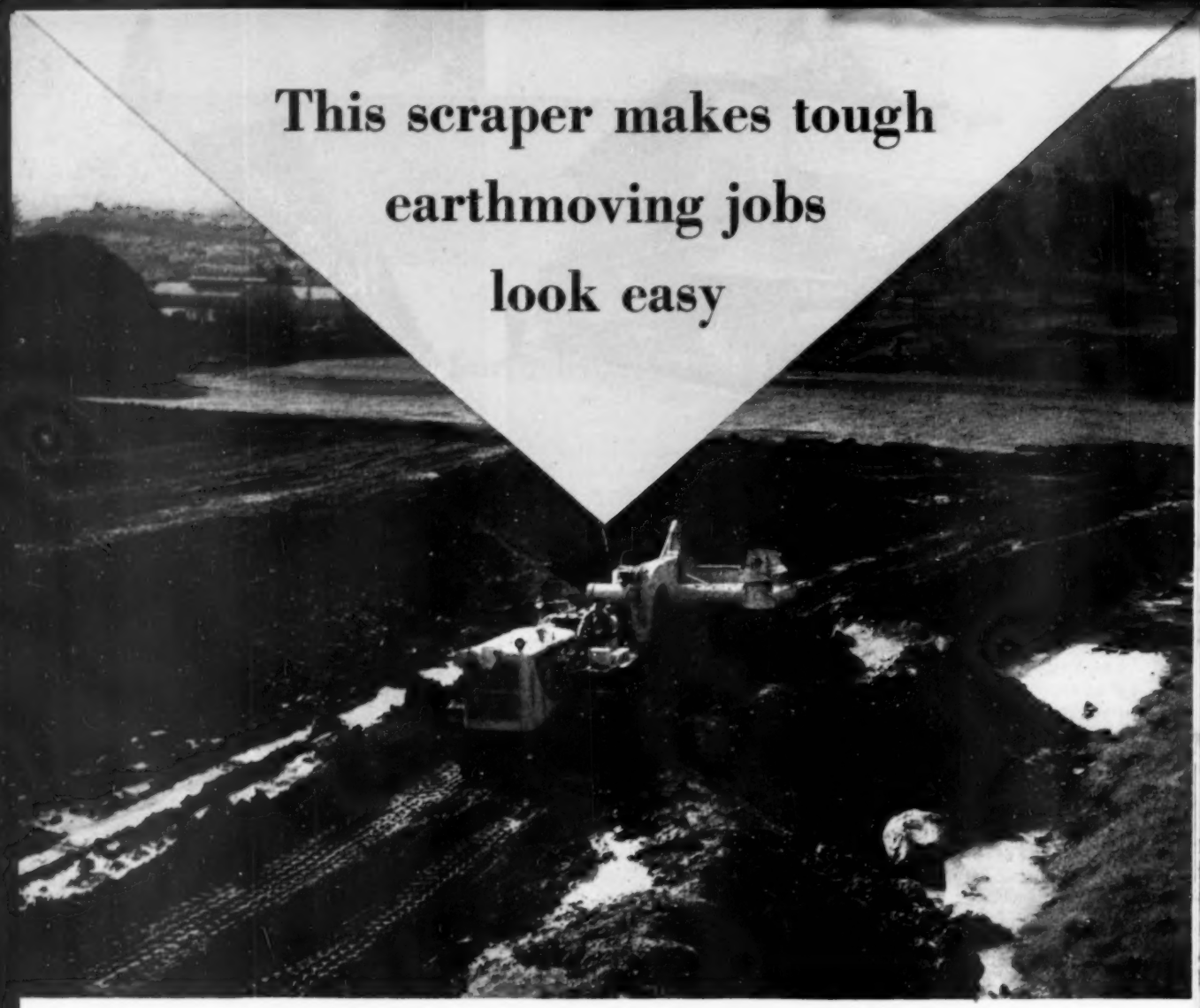
E. A. Gallagher of Philadelphia, recently used uncommon ingenuity in moving a 181-ton suction dredge. It was drawn from a creek at Repaupo, N. J., moved 5½ miles and launched in the Delaware River. Additional equipment, a total of 250 tons, was also moved in 20 loads.

A special ramp was built at the river, the dredge "winched" into position and the lift of the 6-ft. tide was used to float the dredge. Two weeks were required for this entire operation. But the actual moving was done in one day on two Rogers 50-ton low bed trailers and two Rogers 75-ton dollies.

Also pictured here is Roger Sherman of East Hartford, Conn., well known hauler of contractor's machinery in the east, as he recently moved 4,000 factory machines fifteen miles to the new plant of United Aircraft's Hamilton Standard Division.

Among the diversified items was one machine 45 ft. long. It was first estimated that at least 20 days would be required to dismantle and move this machine. Sherman's experience, however, enabled him to move this ponderous machine without dismantling it, the move being made on a Rogers low bed trailer in only 2½ days.

This scraper makes tough earthmoving jobs look easy



WORKING on a contract that called for moving 395,000 cubic yards of rock and clay and grading a 70-acre industrial site in 5 months' time, J. O. Archibald of Redwood City, California, needed rugged equipment with plenty of power and capacity. The terrain was half hill and half swamp. Fourteen Caterpillar Diesel Tractors, with Bulldozers and Scrapers, were used in completing the contract, for Mr. Archibald believes in standardizing on big yellow equipment. But he found one of the most efficient units for this type of job was the Cat* D8 Tractor-No. 80 Scraper combination.

The flat-bottom No. 80 is a brute for work. It handles 20 cubic yards heaped on every swing. Positive cable controls permit easy, accurate control of digging and spreading. Big tires give ample flotation in soft ground, and make hauling smooth. The push-plate, extending well back of the tires, allows in-line power for the pusher.

The surest way to *prove* what the No. 80 Scraper can do for you is to see it in action on your own job. Your Caterpillar Dealer will gladly arrange a demonstration. Call him today.

Caterpillar Tractor Co., Peoria, Illinois.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

Adaptation of the Semi-Automatic Welder to Magnetic Flux

By R. A. Hand

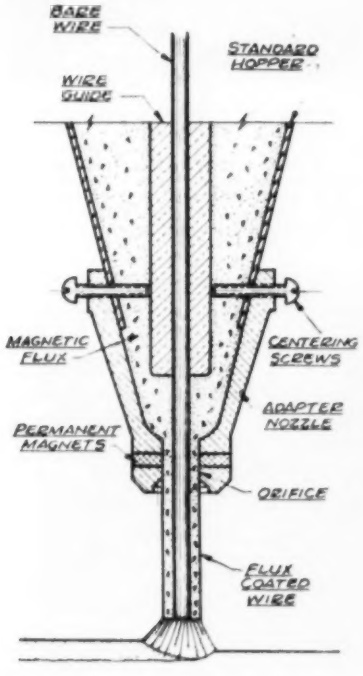
Automatic Welding Specialist, Stoody Company

AN extremely simple, inexpensive nozzle adapter for the conventional semi-automatic or "squirt" welder gives promise of a new and considerably wider use for this machine. The device makes possible the deposit of various alloys at speeds far higher than can be obtained by ordinary manual welding, even exceeds the deposition rate achieved by the full automatic electric welding head. In essence the process utilizes the magnetic field created by the passage of the electric current through the bare electrode, plus a magnetic alloy flux which coats the wire immediately ahead of the welding arc. The operating cycle is completed by the use of permanent magnets in the nozzle adapter which act as a dam to the flow of flux whenever the arc is broken.

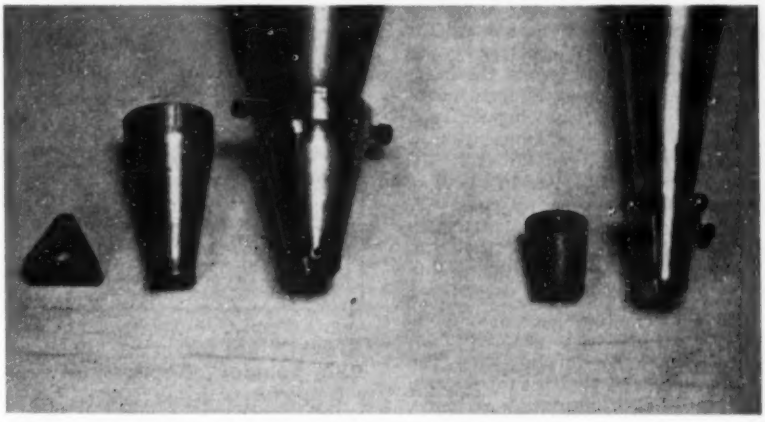
The whole process is merely a combination of two accepted and proven welding methods—the squirt welder which uses a granular non-magnetic flux to produce the common submerged melt deposit, and the magnetic flux method of automatic welding as perfected by Brown Boveri in Switzerland some years ago. The squirt welder, employing the hidden arc beneath a simple flux, is in everyday use and is familiar of course to all those interested in welding.

The Brown Boveri method is less widely recognized. Basically it depends upon use of the magnetic field surrounding the welding electrode in conjunction with a granular magnetic metallic flux. In this machine the flux in the standard hopper is fed by gravity to a cup around the contact jaws. Thus, when the arc is established the magnetic lines of force cause the flux to adhere to the wire, producing what is to all intents and purposes a coated electrode. The amount of flux applied to the wire is governed by the size of the orifice in the cup. In the Brown Boveri equipment an electro-magnetic coil in the cup acts as a dam when welding is interrupted. This general process was covered by European patents some eight years ago and has been used since then for mild steel fabrication much as the submerged melt process has been employed.

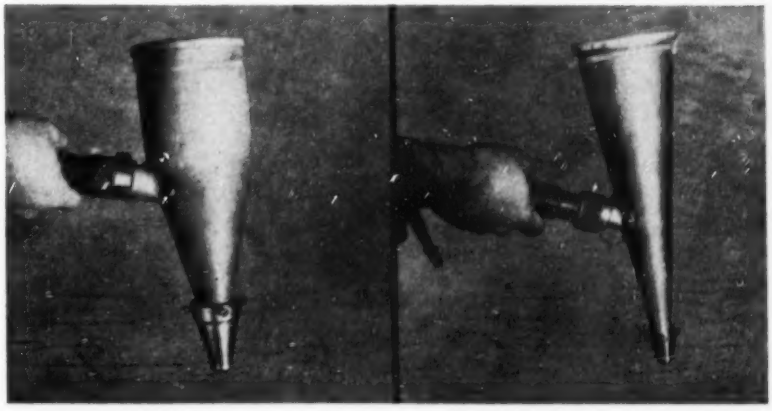
Some time ago Stoody Company became interested in magnetic flux as a possible method of applying alloy materials through semi-automatic welders, the use of which is limited to small diameter wires, generally $\frac{5}{64}$" and $\frac{3}{32}$", sizes too small to be fabricated into tubular wires such as



★ Cross-section through adapter nozzle



★ Close-up of two types of adapter tips installed on standard hoppers. Original tip shown with each



★ Two types of hoppers in common use, fitted with adapter tips

this company furnishes for application through the full automatic head. The Brown Boveri method, as adapted to the squirt welder and tested over a considerable period, appears to offer numerous advantages over both manual and present semi-automatic welding. As applied to build-up and hard-facing, the magnetic process provides much higher deposition rates (8 to 20 pounds of deposited metal per hour, using 5/64" or 3/32" wires); the deposition rate will depend upon amperage. Deposits are sound, with the consistency and uniformity characteristic of the automatic welding method. Time lost in changing electrodes is eliminated and there is of course no stub-end loss. There is no need for maintaining large stocks of various electrode diameters. Welding time and material costs are shown to be markedly reduced.

By comparison with the semi-automatic hard-facing method utilizing an alloy submerged melt flux, the magnetic process eliminates considerable waste, since all the flux applied to the wire is consumed. This feature also makes unnecessary flux recovery equipment and screening for re-use. An important consideration is the fact that with the magnetic process the welder is using an open arc which allows him to see the actual welding at all times, gives him better control of the deposit and permits the hard-facing of irregularly shaped parts. While the conventional hopper is of small size for ease of handling, it is necessary to refill it only infrequently, since the ratio of deposited metal to flux used is approximately equal. Another advantage of the open arc magnetic method as against the submerged melt process is that no flux dams, jigs or fixtures are needed.

The squirt welders now in common use may all be readily adapted to operate with magnetic alloy flux. The photographs and sketch show clearly how easily the adaptation is made. The adapter tip containing the permanent magnets replaces the standard tip, centers the wire to assure a concentric flux coating and governs the amount of flux applied to the wire.

Historic American highways

A 183-page volume on American highway history, with extensive bibliography, maps, etc., has been issued by the American Association of State Highway Officials, 917 National Press Bldg., Washington 4, D. C. Price $4.00 per copy.

This is Volume II of a set which includes a previous publication, "Public Roads of the Past," available together at $6.00. Foreign postage extra in each case. Readers interested in this unique review should remit directly to the above address.

WHAT'S NEW
in EQUIPMENT and MATERIALS

System Lengthens Oil Change Periods

A built-in system of controlled pressure, which makes it possible for hot or cold oil to pass through the filter element instead of the bypass under any operating conditions, has been introduced by Winslow Engineering Co., 4069 Hollis St., Oakland, Calif. This controlled pressure element design is stated to make it possible for oil to be completely cleaned and filtered even under conditions frequently encountered by operators of contracting equipment. It means that engines will have complete protection when first underway, under the most adverse weather conditions.

On bound-in post card please fill in description of item on which more information is desired. The card is provided for your convenience in making inquiry and in obtaining catalogs or other data. Card works for both advertising pages and reader items.

Drop post card into outgoing mail. No stamp is required.

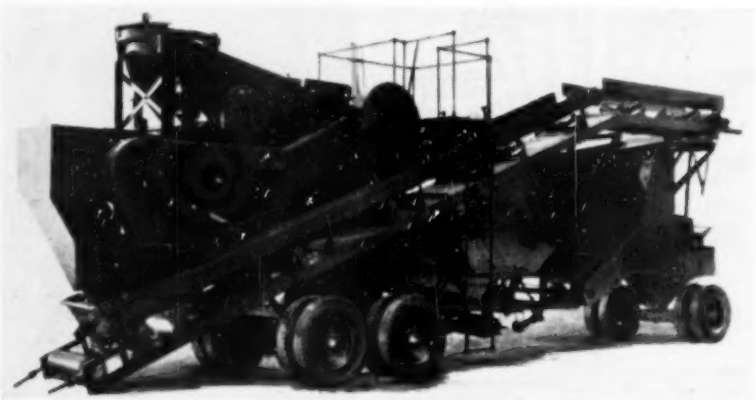
Gravel Plant for "Big Boulder" Application

A new single chassis portable gravel plant designed for "Big Boulder" application, Model 33G Triplex, is a recent addition to the line of Pioneer Engineering Works, Inc., Minneapolis 13, Minn., subsidiary of Poor & Co., Chicago. Designed for use in areas where pits contain a relatively high percentage of big boulders, the important features of this crushing and screening plant include: An 18 in. x 30 in. primary jaw crusher; Pioneer's exclusive 30 in. x 18 in. triple roll secondary crushing unit, permitting two almost simultaneous passes at the rock or gravel; all major units of the plant mounted on a single chassis permitting rapid and frequent moves from one gravel pit to another. The larger jaw crusher, and the triple roll secondary crushing unit are stated to eliminate the need for an additional "rock plant" to handle the larger boulders. Other basic units of the plant are: a single-deck, plate scalping screen, a 1½-deck secondary vibrating screen, hopper, mechanical feeder and necessary conveyors. All the major units are assembled on a welded steel truck frame which in turn is mounted on a rear equalizer and single front dolly with 12 pneumatic tires. Total weight of the plant (less power unit) is approximately 71,000 lb.

Compactor Has New Hauling Yoke

A new flanged hauling yoke on its compaction roller, according to an announcement by Southwest Welding & Manufacturing Company, Alhambra, Calif., permits changing the draft beam to match the DW-21 Caterpillar and/or other standard wheel or track-type tractors. The unit has four weight boxes which may be filled with

Southwest's Compaction Roller with New Hauling Yoke

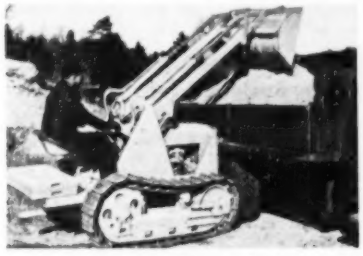


Model 33 G. Triplex Gravel Plant

any material to attain a single tire load as high as 53,000 lb. Each of four weight boxes rides on its own wheel and tire. These weight boxes are hinged at the rear to oscillate independently up and down a distance of 12 in. This is stated to permit maximum compaction over the rough, uneven surface of fills without bridging or shifting the compaction load.

All-Hydraulic Tractor Loader

A new, versatile, multi-purpose model 3-WI loader unit, announced by The Oliver Corporation, 400 West Madison St., Chicago 6, Ill. is model "OC-3" Industrial crawler tractor. Manufactured exclusively for the "OC-3," the loader is all-hydraulic in operation and perfectly balanced and mounted for efficient operation. The new unit is called the "OC-3" tractor-loader. The outstanding operation features claimed for of the tractor-loader include—extreme bucket rotation that permits dumping from ground level to full lift height. The bucket



Oliver "OC-3" Tractor Loader

angle in dump position is 75° from level at ground level, 55° from level at full lift height. Full lift height is 10 ft. 9 in. with bucket level. Loading height at bucket hinge point is 9 ft. 5 in. The bucket can be used to dig to a depth of 16 in. below track level, or the bucket may be used for leveling, scraping and stripping operations. Bucket capacity is ½ cu. yd. and lifting capacity is 2000 lb.

¾ Cu. Yd. Shovel, Crane Added to Michigan Line

Two new ¾ cu. yd. power shovels, crawler and truck mounted, have been added to the Michigan line of excavators and cranes of Clark Equipment Co., Buchanan, Mich. The new equipment will be manufactured in two truck-mounted models and one crawler model and will be available for delivery in the Spring. The development program for the new unit, started more than three years ago, has resulted in a completely new design. Advanced styling principles have been applied to the cab to assure safer and more efficient operation, and numerous mechanical innovations have been incorporated in the design of the new units. The ¾ cu. yd. shovel is the first new product to be added to the Michigan power shovel line since Michigan Power Shovel Co. was acquired by Clark Equipment Co. last May. Development on the shovel was substantially completed at that time. Model designations for the ¾ cu. yd. machine, which will be available with a complete range of attachments, follow: Model C-24 - ¾ cu. yd., crawler-excavator. Model T-24 - ¾ cu. yd., truck crane with 6 x 4 or 6 x 6 drive.

Michigan Crawler Model C-24

Rubber Mounted Bituminous Paver Finisher

A new rubber mounted bituminous paver finisher, announced by All Purpose Spreader Co., Elyria, O., is stated to spread, level, and tamp hot or cold bituminous mix in one continuous operation. These pavers are also being used successfully in paving pugmill mixed lean cement mixtures. No forms are required for any of these paving jobs, according to the specifications. The rubber mounting design is stated to offer sure traction on hard surface with tack coat or on spongy subgrades and other "tricky" surfaces. Backtracking is stated to be faster, quieter,

Bituminous Paver Finisher in Operation on Missouri State Highway

newly laid surfaces can be crossed sooner. Another design feature is the longer wheel base and floating type screed which is claimed to produce desired results with fewer passes, particularly where there have been numerous dips and bumps in the sub-grade. The finisher has an overall length of 19 ft. and width of 10 ft. Approximate weight is 20,000 lb. Spreading width is 8 in. to 13 ft. Spreading Depth: 0 in. to 10 in. Eight working speeds range from 18 to 74 ft. per minute while travel speed is 5½ mph.

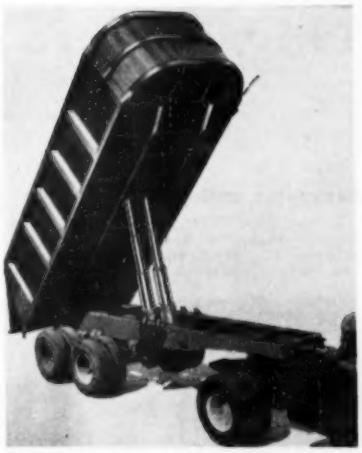
36 in. Portable Belt Conveyor

A 36 in. wide portable belt conveyor had been added to the Model 101 line by Kolman Manufacturing Co., Sioux Falls, S. Dak. It carries an 8 ft. by 48 in. vibrating screen which is entirely supported by the conveyor during operation and need not be removed during transportation. Features of the conveyor include self-cleaning tail pulley, bar type self-lagged head pulley, all anti-friction bearings, choice of greaseless or regular ball bearing idlers, pneumatic tires, separate clutch for individual operation of vibrating screen and conveyor belt, hydraulic hoist with "V" type carriage trucks for low road clearage, and self-cleaning steel belt cover. A steel bull dozer trap, available as optional equipment, is an integral part of the conveyor tail section and is therefore also fully portable.

36 in. Model 101 Conveyor Loading Gravel and Scalping Out Oversize

New Line Telescopic Hoists

A new line of telescopic hoists, announced by Perfection Steel Body Co., Galion, O., is specifically designed for 12 ft. to 24 ft. dump bodies for trailers or tandem trucks. Four models are available. These include single-acting units with



New Perfection Telescopic Hoist

either twin 7 in. or 8 in. cylinders and 80 in. stroke, and single-acting units with 7 in. or 8 in. cylinders and 54 in. stroke. On trailer applications twin models are available for power fifth-wheel installation or with hydraulic pump mounted on the tractor. Quick disconnecting fittings for hose connection to the trailer are provided. Perfection telescopic hoists feature cylinders mounted with pin-eye end connections. This feature permits a free swinging action of the cylinders thereby eliminating stress and strain on the hoist at times unbalanced loading. The Perfection hydraulic pump features an exclusive development termed "pressure pocketing," a method of applying pressure to the back of the thrust plates to keep them in sealing contact with the gear ends.

Traveling Rock Crusher Works Right on Road

A new machine, the BMCO Rock Buster, developed by Lewis-Browning Mfg. Co., 111 Humble Ave., P.O. Box 2707, San Antonio 6, Tex., reduces oversize rock in pit run material to the sizes best suited for macadam or asphaltic road base and does it right on the roadway. The Rock Buster is a multiple hammer type machine, equipped with 18 - 36 lb. hammers rotating at the rate of 1000 rpm and powered by a 90 hp diesel engine. The machine is heavily

BMCO Rock Buster

steel armored for safety against flying rock. It has undergone extensive tests in many thousands of yards of the toughest kinds of rock. Gravel or various forms of rock with their desired binder may be dug from their natural formations with power shovels, loaded in trucks and dumped directly on the roadway in continuous piles, from which a motor grader then blades off a windrow suitable in size for the 4 ft. wide and 2 ft. high throat of the Rock Buster so it can be towed astride the windrow to reduce the oversize and blend with the natural binder. The motor grader then follows the Rock Buster moving the

blended material over further to the edge of the base area thereby providing space for the next windrow of unbroken material. Repetition of this cycle is stated to result in all oversize being reduced and perfectly blended with binder material ready for the final blading and shaping for a road base.

Excavator and Crane

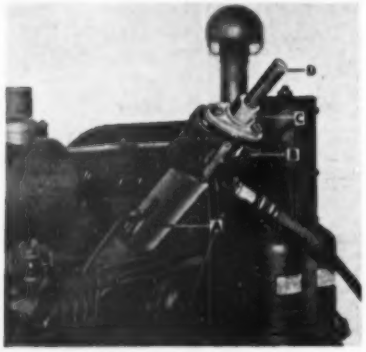
A new Type WB excavator and crane, now in full production by the Insley Manufacturing Co., 801 N. Olney, Indianapolis 6, Ind., is adaptable to shovel, hoe, hook-

Type WB Shovel on U. S. 41 in Wisconsin

work, dragline, clamshell, logging, pile driving and magnet operations. Crawler, truck and self-propelled rubber tired (carrier) mounting is available as may be required. Features include: power lowering on the main load line, independent travel, multiple travel speeds, independent 3rd and 4th drums, high folding power-operated gantry, pin or butt-connected crane boom, log loading booms, wide selection of drum laggings, easily removable crawler frames, and quickly removable counterweights. All drums and high speed shafts are mounted on anti-friction bearings; involute splining is used throughout. The independent boom hoist is operated with power up and power down. Gasoline, diesel or electric power can be furnished.

Pre-Cup Puller

An improved design puller for removing the pre-combustion cup on all International diesel engines has been announced by the Owatonna Tool Co., 417 Cedar St., Owatonna, Mich. This tool is fast operating, provides a more positive grip and will pull all cups regardless of their condition. It consists of three sizes of expanding collets which grip the inside diameter of the cup, an expanding screw which tightens the collet in the cup, a puller screw "D," sleeve "A," forcing nut "C" and Power-

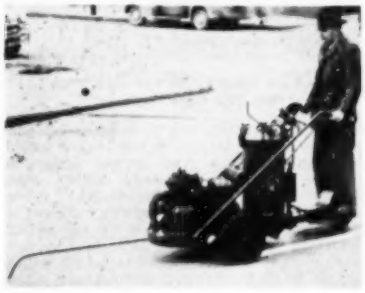


New OTC Pre-Cup Puller

Twin ram "B" when used hydraulically. This tool can be used manually as well, in which case the hydraulic ram "B" is not used, and the nut "C" is turned with a wrench.

Traffic Lane Marker

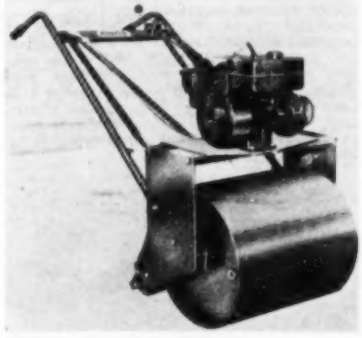
A new low-priced centerline traffic lane marker, that handles both reflective and standard paints, and incorporates a unique rear steering device has been announced by the Meili-Blumberg Corp., New Holstein, Wis. Known as the Model 6-18 it has an 18 gal. capacity and is powered by a 6 H.P. Wisconsin engine. It is claimed to lay a single line, solid or intermittent, with or without reflective beading, at a rate of 3 to 5 miles per hour. The spray gun can be set for center line marking, or may be mounted on a frame outside of the wheels, either right or left, thus permitting close work up to safety islands, curbs, etc. The unit is self-powered with a unique pivot arrangement of the rear wheel, enabling the machine to be easily steered in circles, figure 8's, straight lines or to conform to any desired marking job.



New M-B "Glow Striper"

Convertible Power Roller

A new hand guided power roller which can be easily converted into a soil aerating machine has been announced by Sollaire Industries, 1200 Second Ave. South, Minneapolis 3, Minn. Called the Rollcor, this new roller has a Briggs 1½ h.p. engine, a heavy duty B-belt clutch, is 19 in. in width and weighs 410 lbs. water load, and 495 lb. with sand. The roll is 18 in. in diameter and built of 3/16 in. steel plate. By dis-



Rollcor Convertible Power Roller

connecting the drive chain and taking off one side-plate, the roller can be dropped out and an aerating attachment can be quickly installed.

Mower Has Leaf-Mulching Attachment

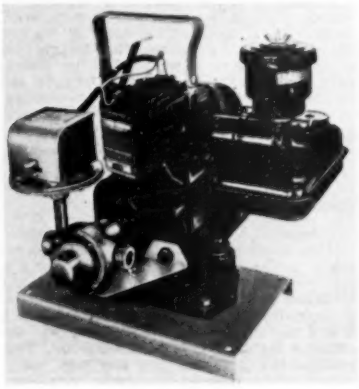
A new 72-in power-take-off rotary with a leaf-mulching attachment has been introduced by Worthington Mower Co., Stroudsburg, Pa. The unit, drawn by a

72 in. Power-Take-Off Rotary Mower

Worthington Model "G" Tractor with SAE power-take-off, is stated to cut through dense overgrowth with ease. With leaf-mulcher added, it has the ability to quickly reduce leaves and other cuttings into a fine powder, putting nutriment back into the soil to improve the turf. The machine features two staggered cutting bars that completely eliminate uncut streaks, and large 6:70 x 15 drop center wheels for maximum flotation. The wheels are individually adjusted for height, from the ground to 10 in., by two simple, quick-acting cranks.

Pump Designed for Multi-Purpose Use

Complete portability and functional simplicity are two of many features claimed for a new gasoline engine-powered pump announced by Dept. KP, Hypro Engineering, Inc., 404 No. Washington Ave., Minneapolis 1, Minn. The hollow shaft pump, Model G 3800 VS, mounts directly on the drive shaft of a Model 5S 1 H.P. Briggs & Stratton gasoline engine and will run for 1¾ hours on a tank of fuel. The unit



Model G 3800 VS Pump

weighs 35 lb. complete with engine, fuel tank, hinged carrying handle and base plate. Capacity of the pump is up to 8 gal. per minute open discharge. Pressure range of the pump is up to 30 lb. It will lift water up to 10 ft. unprimed, 22 ft. primed, and has outside threaded ports to accomodate hose couplings.

Tractor Loader Has 180 Degree Boom Swing

An 180 degree boom swing permitting discharge of the load left or right, in addition to front, without moving the loader out of the loading position line, is an exclusive feature of the new speed swing loader announced by Pettibone Mulliken Corporation, 4700 West Division St., Chicago 51, Ill. The loader is available with 2 or 4 wheel drive, optional 4 wheel steer, ¾ or 1 cu. yd. bucket, and with the following accessory attachments: fork, crane hook, backfiller blade, and 4 cu. yd. snow bucket. One of the outstanding features is a 30 bucket tilt-up, providing shovel action. Other features are a torque converter transmission system which delivers uni-

SUCCESSFUL CONTRACTORS REPORT ON...

MADSEN ASPHALT PLANTS

GLEN L. "DICK" ROWELL

J. C. COMPTON COMPANY

McMINNVILLE, OREGON

Says..."Our maintenance cost and downtime for the production of 88,981 tons of mix was very low, and we are proud of our new MADSEN Model 481 4000-lb. Asphalt Plant."

The J. C. Compton Company used their MADSEN Asphalt Plant to complete contracts on three highway jobs during the 1953 season. In spite of adverse rainy conditions, highest daily production was 1452 tons or 181 tons per hour of Class "B" Asphaltic Concrete mix.

● WHY NOT FIND OUT HOW THE MADSEN MODEL 481 4000-lb. BATCH CAPACITY ASPHALT PLANT CAN SAVE YOU TIME AND MONEY AND STEP-UP YOUR PRODUCTION? Write for your copy of Bulletin No. 800 and name of your nearest MADSEN distributor.

Here is the MADSEN Model 481 4000-lb. Batch Capacity Asphalt Plant in full operation. Note that the mixer operator station is located on the end of the plant away from fumes, heat and dust, where operator can see both in-coming and out-going trucks. Plant is furnished with complete safety equipment, larger operating platforms and stairway and caged ladderway structures. The oversize weigh-box unit is roller mounted for quick, easy access to mixer.

HERE ARE SOME OF THE REASONS WHY THE MADSEN MODEL 481 ASPHALT PLANT GIVES YOU REDUCED COST-PER-TON FOR EVERY TON PRODUCED

- **New MADSEN Model 440 Twin-Shaft Pug Mill Mixer (Patent Pending) with improved mixing action, faster discharge, built-in oversize capacity and precision-ground, externally removable sectional liners.**
- **MADSEN Pressure Injection System (Patent No. 1987243) which pumps the asphalt into the mill in 5 to 7 seconds.**
- **Faster mixing cycle. Bin gates, asphalt pressure injection, and mixer gate are all air operated to speed the mixing cycle and add tonnage at the end of the day.**
- **Unit construction, designed for quick, easy field erection and dismantling.**

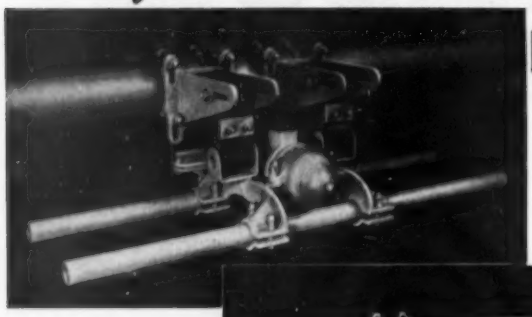
Let's Clean-up America's Highways
America's highways are beautiful. Don't make them a dumping ground for cans, bottles and rubbish.
MADSEN ASPHALT PLANTS

MADSEN IRON WORKS, INC.

14100 E. ROSECRANS AVENUE, P. O. BOX 38 LA MIRADA, CALIFORNIA

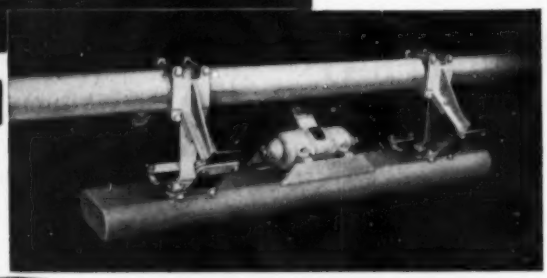
MADSEN Equipment that Serves ®

SURFACE and INTERNAL VIBRATION
for CONCRETE PAVING



INTERNAL TYPE

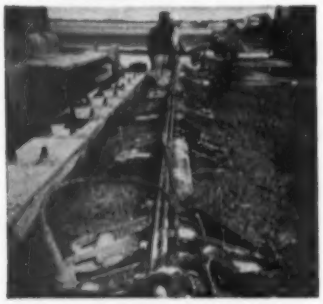
Tubes vibrate deep in concrete. One unit, as shown, for each 5'-0" (maximum) of slab width. Usually attached to front of finisher.



SURFACE TYPE

Tube vibrates on surface. Accomplishes thorough densification of 10" concrete slabs. One unit, as shown, for each 6'-0" (maximum) of slab width. Usually attached to rear of spreader.

JACKSON GIVES YOU BOTH!



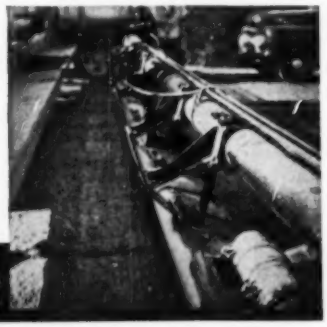
A 25', 5-motor Tube of the internal type quickly plasticizing a tough mix on thick slab construction.

The contractor who owns a Jackson Paving Tube can quickly switch from INTERNAL to SURFACE vibration, or vice versa, and meet any concrete slab specifications — at a minimum of equipment investment.

Supplied with extraordinarily powerful motors, the JACKSON INTERNAL Paving Tube will thoroughly vibrate all concrete slabs as thick as 24" and as wide as 25', quickly plasticizing the very dry, harsh mixes. Attached to a standard finisher, its use materially reduces spreading labor where no spreader is used. Adapted to SURFACE vibratory operation, it will do a perfect job of vibrating any mix in depths up to 12". Powered by a Jackson Portable Power Plant mounted on parent equipment and controlled by its operator.

For better results and lowest possible costs buy a JACKSON Vibratory Paving Tube. See your Jackson distributor or write for complete details.

On this job, on which no spreader was used, the Paving Tube materially reduced the cost of spreading concrete.



In this view note the highly plastic condition of the concrete accomplished by the surface type Paving Tube towed by the spreader.

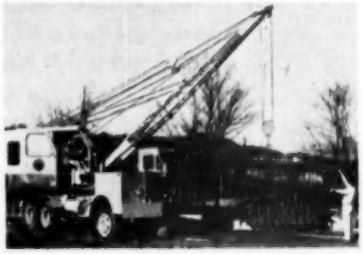
JACKSON VIBRATORS, INC.
LUDINGTON MICHIGAN

Pettibone Speed Swing Loader

form power at maximum efficiency and inch-by-inch crowding without shifting gears, a 15 ft. discharge height over fully raised bucket, a 3 ft., 3 in. reach from the front tires at a 10 ft. dumping height and a 5 ft., 4 in. reach at a 7 ft. dumping height.

Truck Crane

Production of a truck crane version of its recently improved 205 excavator has been announced by Koehring Co., 3026 West Concordia Ave., Milwaukee, Wis. As a crane it will lift loads up to 15 tons and its road travel speed is 32.6 m.p.h. The crane operator's cab has been redesigned and operating levers have been rearranged for easier handling. The turntable swings on four adjustable hook rollers. When equipped as a shovel, the dipper is tripped

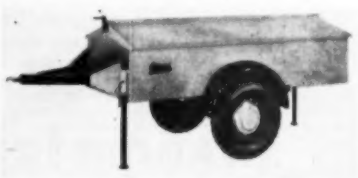


Mode 205 Truck Crane

electrically. The 205 can be adapted to clamshell, dragline, shovel, and hoe work. For special high lift crane service, straight boom jibs, 15, 20, 25, or 30 ft. long, with cable and counter-weighted hooks, are available. Safety boom limit stops are standard equipment on the improved 15-ton truck crane. Power lowering is also standard. The 205's truck body has 10 forward speeds, ranging from a low of 2.03 m.p.h. to 32.6. There are two reverse speeds: 4.08 and 2.04 m.p.h.

Portable Allsteel Tool Box

A tamperproof, ruggedly built, fast trailing pneumatic-tired all-steel tool box claimed to meet the needs of the average general contractor adequately is being introduced by Aeroil Products Co., Inc., 69 Wesley St., South Hackensack, N. J. Featuring rigid telescoping sturdy stand legs at each end, this 6 ft. box has overall length of 114½ in. including tow frame, overall height of 49 in. and loading height of 41 in. Load capacity is 2000 lb. The Aeroil toolbox has one padlock that protects the entire box. One man can open or close both lids from a single position. In locking the handles pull the covers in tight, where they lock under the box rim. It is impossible to open either cover unless locking handles are released.



Aeroil Portable 6 ft. Tool Box

Truck Mixers Have Improved Weight Distribution

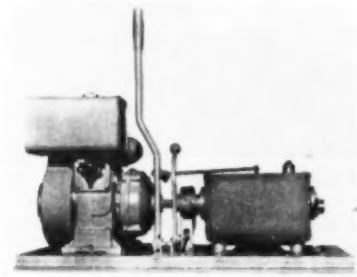
New 5 and 6 cu. yd. truck mixers featuring improved weight distribution have been announced by Willard Concrete Machinery Sales Co., Lynwood, Calif. The center of gravity has been moved forward

New Willard Truck Mixer

and lowered by combining the pedestal and 90-gal. water tank. Thus greater payloads are possible on any 10-wheel truck of 175-inch wheelbase or more, yet they are well within legal highway load limits. Power for the mixing drum is supplied by a rear side mounted Chrysler 6-cylinder industrial engine. All controls are conveniently located. Improved engineering design provides built-in strength and lightweight throughout frame and drum construction. Easy concrete placement is accomplished with the rachet controlled chute which measures 14 ft. when extended.

Portable Integral Power Transmission Unit

A new portable integral power transmission unit, built by Solilaire Industries, 1200 Second Ave., S., Minneapolis, Minn., can be used as a power unit, winch, portable hoist, tugger, or transmission element for machine tools. A Briggs & Stratton



Portable Integral Power Transmission Unit

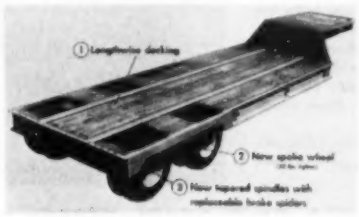
5 h.p. engine with a 6:1 reduction is connected to an oil tight transmission containing two Maxitorq disc clutches in line on a single shaft for forward and reverse drive. The entire unit, weighing 186 lb., is mounted on a framed steel base 38¾ in. in length with four studs for locking in position.

Unit Machines with Torque Drive

After successfully introducing torque drive in over 250 machines, engineers of Unit Crane & Shovel Corporation, 6411 West Burnham St., Milwaukee 14, Wis., have extended the program to include additional models. Their first step was to equip ½ yd. machines with Chrysler IND-16A 6-cylinder industrial gasoline engines and Chrysler torque converters. Now the ¾ yd. machines will be available with Chrysler IND-19A-V8 industrial gasoline engines with Chrysler torque converters. Both of these installations have become standard equipment for gasoline powered machines without additional cost. Another development has been to equip ½ yd. diesel powered machines with torque converters as optional equipment. A 2-cylinder G.M. 2-71 diesel engine with Fuller torque converter is used to power Unit 614, 617, and 1014 machines.

Trailer Has 3 Major Improvements

Three major improvements for bettering the performance of its heavy-duty low bed trailers have been announced by LaCrosse Trailer Corporation, LaCrosse, Wis. To provide extra strength and durability in end loading, all LaCrosse Model DF6T tandem axle trailers are now being supplied with tough oak decking running parallel with the trailer length, as shown in the accompanying illustration. Decking is also specially recessed into the trailer frame to give a much lower loading height. LaCrosse engineers have also developed a new tapered automotive-type spindle, with a husky bolt-on casting, which permits quick, low-cost replacement of brake spiders, without having to purchase or remove expensive welded axle assemblies. Load center of wheels has also been moved



Improvements to 20 to 40 Ton Capacity LaCrosse Tandem Model

in to utilize larger stock size wheel bearings. Axles will continue to be heat treated and cambered for minimum tire wear. Improved spoke-type wheel design, with 6 individual rim lugs, is said to save approximately 30 lb. of useless deadweight per wheel, in the new LaCrosse trailers, in addition to simplifying alignment of wheels and rims. Average total weight saving per trailer is 120 lb. Wheel and hub are cast integral from the best grade of S.A.E. 1030 steel.

Tractor-Mounted Rock Drill

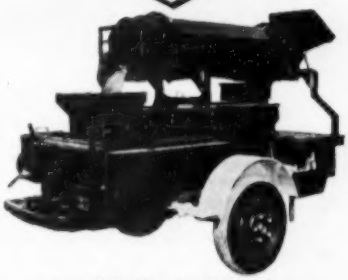
A new tractor-mounted rock drill, the Eeco, has been placed on the market by Eugene Engineering Co., P.O. Box 415, Eugene, Ore. The unit is complete with its self-contained compressor, drill and feed, air lines and motive power. Mounted on any crawler tractor that can power a 400 cfm compressor, the Eeco is stated to have the comparative capacity of two standard 4 in. wagon drills, according to the manu-

The Eeco Rock Drill

facturer. Its easily positioned boom is designed to drill in any selected direction or angle. The drill assembly consists of a 23 ft. drill track with a 4 inc. drifter, operated

(What's New continued on page 92)

PATCH
PAVING
At Lower Cost
with
WYLIE
REPAIR UNITS



Portable Hot Asphalt Plant
Single Unit Heats & Mixes

Tow your **PATCHMOBILE MODEL PM-215** to the job . . . and have all the equipment you need for hot asphalt patches! Features rotary dryer, asphalt tank, pugmill, power asphalt pump, spray attachment, volumetric asphalt measuring device and tool-heating compartment . . . all in one unit. With Patchmobile PM-215 there's no manual handling of aggregate and asphalt from charging hopper to discharge chute.

Truck Tailgate Asphalt Mixer
Compact Pugmill and Heater

Use **HEAT-A-MIX** to make cold stockpile material as workable as fresh hot-plant mix! This compact, high-capacity pugmill and material heater has its own gasoline engine and propane heating system. Heat-A-Mix mounts quickly and easily by interchanging with truck tailgate.

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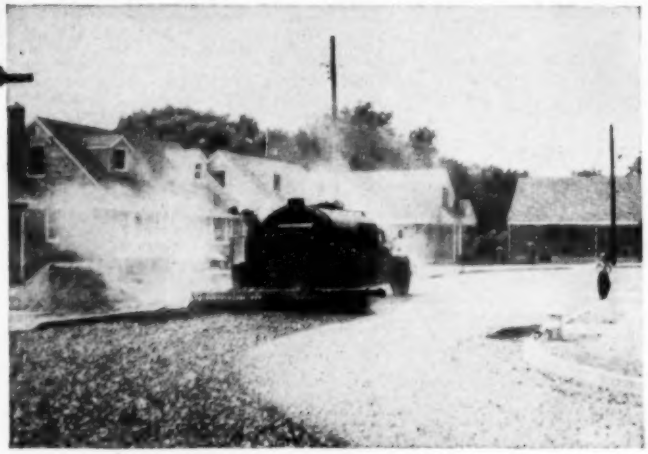
LITTLEFORD

"Spray-Master"

BITUMINOUS DISTRIBUTOR

Gives Low Cost • Mix in Place • Seal Coat Jobs



Here's the Bituminous Spraying unit that will handle Asphalt, Tar, Emulsions, Cut-Back and Road Oils for any road maintenance or construction work. It's engineered to operate with the minimum of cost and designed to eliminate valves, pipe lines and controls, making it simple to operate.

Spray Bars operate up to 24 ft. in width, both the Standard Suck-Back Bar or the Full Circulating Vacuum Flow Bar give 100% efficient spraying action.

Littleford "Spray-Master" Bituminous Distributors are the most modern units on the market today. Made in either truck mounted or semi-trailer models. Sizes range from 800 to 4000 gallons.

"Spray-Master" Distributors are fast heating, safe, efficient, low-cost in operation. See your nearest Littleford Dealer or write.

LITTLEFORD BROS., INC., 454 EAST PEARL STREET, CINCINNATI 2, OHIO

The NEW ME-13 vibrator with new 2 to 2½ HP motor —greater power in a smaller "package."

ANNOUNCING MORE

IMPACT

THAN EVER BEFORE!

A powerful vibrator that *maintains* its *kick* and speed EVEN IN EXTRA-STIFF CONCRETE!

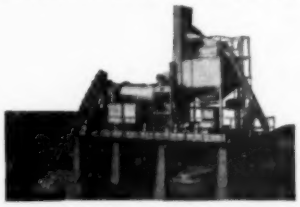
Moves concrete faster WITHOUT extra high speed (which causes excessive wear of equipment).

Needs no special generator — just 110 volt AC or DC.

Mounted on rigid or swivel base that keeps motor out of dirt, and prevents sand blowing into armature.

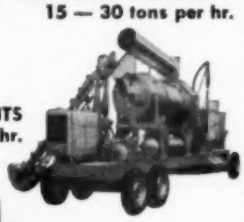
Satisfaction guaranteed. See it at your nearest WHITE equipment dealer.

White



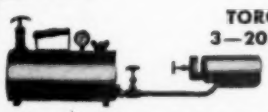
STATIONARY ASPHALT PLANTS
15 — 30 tons per hr.

PORTABLE ASPHALT PLANTS
10—15 tons per hr.



TAR KETTLES
65—300 gallon

TORCHES
3—20 gallon



For prices, catalog and name of your nearest dealer, write —

WHITE MANUFACTURING COMPANY
ELKHART 20, INDIANA

veteran Macks take toughest jobs on big highway project

Mack dumpers, veterans of the famous New Jersey Turnpike, are once more demonstrating their broad-shouldered staying power on a big highway project.

Owned by George M. Brewster & Sons, one of the major contractors working on New Jersey's Garden State Parkway, these same Macks all have more than 100,000 miles of the most arduous service to their credit.

To them go the toughest assignments—the jobs that cannot be efficiently handled by scrapers, loaders and dozers. At one point, for example, the big Macks haul out ponderous loads of clay muck scooped up from the bottom of a swamp. At another point, they're taking out sandstone and conglomerate which proved too difficult for scrapers and loaders.

Brewster's present fleet of 95 Mack trucks has a long background of tough construction jobs successfully met and surmounted. For more than 25 years George M. Brewster & Sons have consistently repeated on Macks.

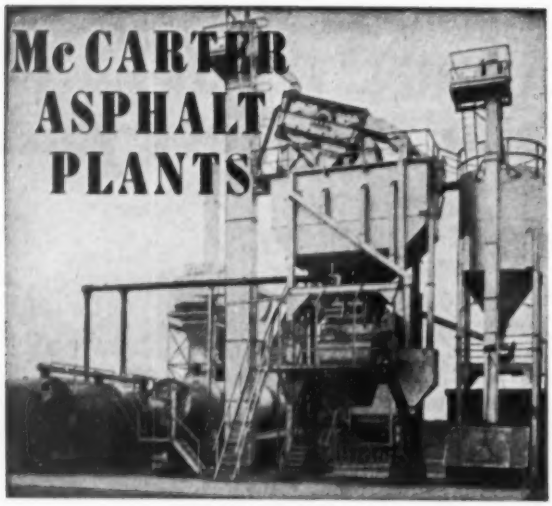
Their experience proves—for the jobs that stop other trucks cold—it pays to order dependable, long-lasting Mack trucks.

Mack TRUCKS

where you see tough jobs . . . there you see Macks

Mack Trucks, Empire State Building, New York 1, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

2185



TRULY BALANCED PLANTS OF 2000 TO 6000 LB. MIXER CAP.

- McCarter . . . backed by 20 years experience . . . designs and manufactures this equipment in their own works, assuring standardized parts and minimum costs.
- McCarter standard plants are readily adaptable to your special requirements. Individual units are also available.

DRYERS (Hot or hot and cold material, center outlet type)

MIXERS, ASPHALT BUCKETS (Steam, hot oil or electric heated)

AGGREGATE HOPPERS, BINS, APRON TYPE FEEDERS, CYCLONE COLLECTORS, ELEVATORS, STEEL STRUCTURES

REPAIRS AND MODERNIZING

We specialize in remodeling old plants for better production and more efficient operation.

CALL FOR ONE OF OUR ENGINEERS TO GO OVER YOUR PROBLEMS WITH YOU

Mc CARTER IRON WORKS, INC.

NORRISTOWN, PENNSYLVANIA

(What's New continued from page 89)

with an air feed motor, chain and sprockets. The total travel of the drifter is 20½ ft. which is stated to allow drilling a full 20 ft. without changing steel. The drill assembly is mounted on a fabricated base frame, attached to standard dozer trunnions. The rear assembly consists of water tank and air receiver and also the compressor, which is powered by the tractor motor through power take-off. The Eeco is equipped for either dry or the new "Flotation" drilling.

Magnetic Flux Materials for Construction Welding

Stoody Company has developed a series of magnetic flux materials designed for both build-up and the application of hardfacing overlays. The alloys will be marketed under the trade name of Stoody Magnecote, numbered and described for purposes of identification. The first material to be released is Stoody Magnecote 301 which produces a manganese deposit of full Hadfield properties. Other materials will be marketed very shortly, following conclusive tests.

These materials are specially designed for the adaptation of the semi-automotive welder to magnetic flux, using an adapter nozzle (as discussed in a feature article in this issue of Roads and Streets).

Literature describing the alloy flux and adapter nozzle is available upon request to Stoody Company, Whittier, California.

Heavy Duty Bantam Crane Carrier

The addition of an all-new, specially designed crane carrier to its line of factory furnished trucks available for mounting the Model T-35 Schield Bantam, has been announced by Schield Bantam Co., Waverly, Ia. Featuring a rugged 12 in. I-beam frame, 26,000 lb. rated rear axles and large tires, the new carrier is

Heavy-Duty Bantam Crane Carrier

stated to provide maximum stability and versatility under all operating conditions. Maneuverability is an outstanding feature of the new carrier which has a short 16½ ft. turning radius. The carrier has a 148 in. wheelbase; 4-wheel drive; 10 wheels with 8:25x20 tires; Hercules JXC 6-cylinder, 282 cu. in. industrial type gasoline engine developing 113 hp at 3200 rpm; 26 gal. gasoline tank; and a 5-speed transmission with dual range giving up to 10 speeds forward and 2 reverse. The overall length is 236 in.

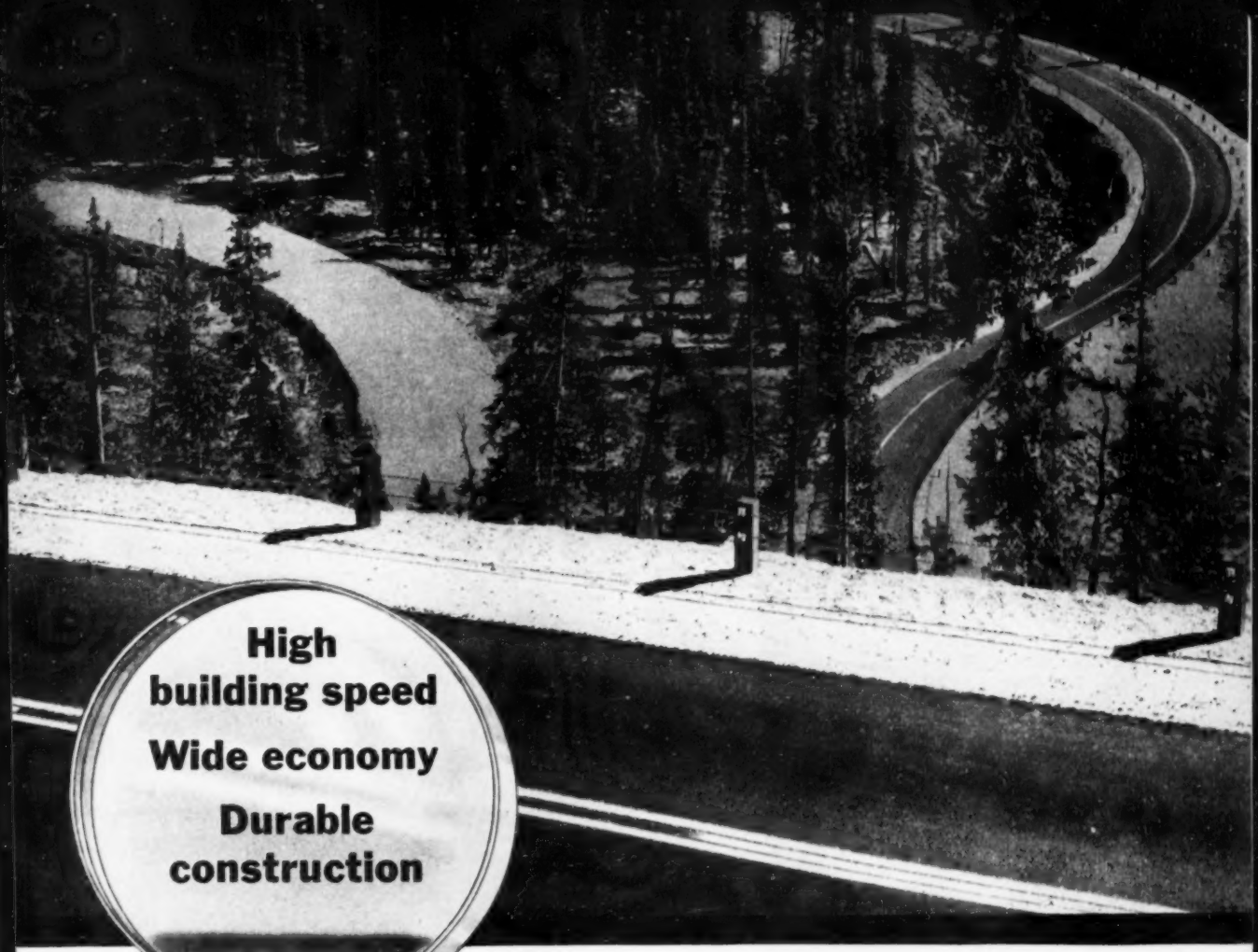
8-Speed Transmission for Trucks

Drivers of highway rigs in the 125-160 hp engine class—those delivering up to 385 pounds feet of torque—are now able to utilize 8 speeds forward with a new "one-stick—no gear-splitting" transmission. This is the latest addition to the series of Roadranger transmissions developed by the Fuller Manufacturing Co., Kalamazoo, Mich. The 8 forward speeds are secured by using a 4-speed shifting pattern twice—the first time with the auxiliary section in low gear or low range; second, with the auxiliary section in high gear or high range. This new Fuller R-45 Roadranger attains one-lever ease by a synchronized electric-air power shift between ranges, actuated by a convenient button at the shift lever, by which the operator can pre-select the desired range. The synchronized range shift occurs automatically as the shift lever moves through the neutral position. Advantages claimed for the R-45 Roadranger include: ⅕ less shifts for the operator; gear-splitting is eliminated; rpm loss between shifts is minimized; engine lugging is sharply reduced, more weight can be carried over the payload axle; highway speeds can be maintained on the hills, and in dense traffic, with greater fuel economy.

Tire-Tracks for Construction Equipment

Production is now underway by The Union Chain & Manufacturing Co., Sandusky, O., on the improved Galanot tire track. This improved track, retains all of the advantages of the original track which was used so successfully by the Armed Services during World War II and in addition, has the following improved features: Ease and speed of installation, more tractive effort and larger flotation area, reduced weight, rigid track between supporting tires (no back bend), improved self-cleaning features, larger bearings for longer service life, greater versatility of application with a larger selection of shoe sizes, ease and speed of removal.

(What's New continued on page 96)



Clues to a better road

■ For a better road . . . a smooth, glare-free, safe road . . . asphalt construction offers important advantages to road builders.

High building speed. Easier laying of asphalt, use of lighter and faster equipment, rapid setting of asphalt paving . . . all help speed road construction.

Wide economy. Faster jobs mean fewer man-hours and lower labor costs. Because local aggregate can be used, material costs are lower. Maintenance of asphalt roads takes a minimum of time, labor, and materials.

Durable construction. Asphalt and heavy aggregate, mixed, make strong road foundations. Top courses of asphalt, stone, and sand present long-wearing, waterproof surfaces.

You add further to those road building advantages by using Standard Oil asphalt. With five asphalt-producing refineries located throughout the Midwest, Standard Oil makes the haul to your job a short one. Prompt, reliable shipments eliminate work delays. Freight costs are at a minimum. Standard Oil Asphalt Representatives are situated throughout the Midwest to give you "on-the-spot" service. Phone your local Standard Oil office. Or, write: Standard Oil Co., 910 So. Michigan Ave., Chicago 80, Ill.

STANDARD OIL
ASPHALT

STANDARD OIL COMPANY

STANDARD (Indiana)

When normal production isn't enough...

that Pioneer Edge

PIONEER COMBINES PORTABILITY WITH HIGH PRODUCTION

No other central mix plant can match the PIONEER *Continuflo* when it comes to quick, easy portability. Each major unit is complete on its own tire-mounted chassis. No holes to dig, no special alignment necessary. Just pull in, hook up, lay pipes, and go to work. Pulling out is just as simple.

When it comes to high production, these plants are just as outstanding. The *continuous, uninterrupted* flow of material through the plant keeps trucks busy. Oil content, for instance, can be varied by remote control of the bitumen pump without shutting down the plant. Handy levers control gates on the aggregate feeder and also permit changes in mix while plant is operating. Gates on discharge hopper cut off flow to truck while a new one pulls up . . . still without slowing the plant. Heavy gauge materials and best obtainable pumps, bearings, etc., help keep maintenance at a minimum.

BUY BOTH!
HIGHER OUTPUT
LOWER UPKEEP

Pioneer

Continuflo EQUIPMENT

yields extra tons

Kiewit paves big runway in record time

"Fastest job we've seen," said a Corps of Engineers paving expert as he watched construction of the big runway at March Field Air Force Base.

It *had* to be fast. The runway was 10,000 feet long, 200 feet wide, and built to support wheel loads up to 200,000 lbs. Specifications called for a 1½" hot mix finish coat laid over a 2½" plant-mix binding course. Then there was an additional 75 feet of shoulder paving on either side of the main runway. *And winter rains were due to begin in a few short weeks.*

But Peter Kiewit Sons' Company, contractor on the job, knew their portable PIONEER *Continuflo* Central Mix Bituminous plant could be counted on to exceed its rated capacity while delivering a steady, uninterrupted flow of precision-mixed material.

It didn't disappoint them either, and as usual, Kiewit finished the job ahead of schedule . . . a regular occurrence when a skilled contractor has the PIONEER EDGE on his side.

Mail the coupon below for details on PIONEER *Equipment that will give you extra production.*

● Here's another Kiewit plant on the job. This one, also a PIONEER, Model 101, is shown on a 19.3 mile paving job near Burke, So. Dakota. This job called for 55,000 tons of hot mix.

PIONEER ENGINEERING WORKS, INC.
1515 Central Avenue • Minneapolis 13, Minnesota
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● Please send me information on the equipment checked.

☐ JAW CRUSHERS	☐ GRAVEL PLANTS	☐ APRON FEEDERS
☐ ROLL CRUSHERS	☐ WASHING PLANTS	☐ MECHANICAL FEEDERS
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☐ ORO FEEDERS	☐ BITUMINOUS PAVERS	☐ CONTINUFLO CONVEYORS

Name _____

Company _____

Address _____

City _____ *Zone* ____ *State* _____

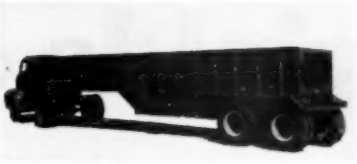
(What's New continued from page 92)

Paving Joint Sealer for Airports

Super elevated temperatures created by the exhaust blast of jet turbines, as well as the action of jet fuel spillage, present a serious problem in maintaining effectively sealed paving joints in airport runways and aprons. In answer to this problem the research and development laboratories of Prestite Engineering Co., 3798 Chouteau Ave., St. Louis, Mo., have formulated their No. 99, a cold-applied vulcanizing-rubber concrete paving joint sealing compound, consisting of two separately packaged components: (1) a liquid base consisting of synthetic rubber, suitable plasticisers, vulcanizing agents, activator and inert fillers; and (2) a dry curing component consisting of accelerators with suitable extenders. Since No. 99 is mixed and applied cold, heating time and the danger of burns to workmen is eliminated. Its high bond and extensibility allow it to withstand repeated expansion-contraction cycles of the pavement. It is resistant to high speed impact of heavy loads. Super elevated temperatures will not cause it to soften or flow. At temperatures of zero and below it remains pliable and will not crystallize.

10-14 Cu. Yd. Hopper Dump Trailer

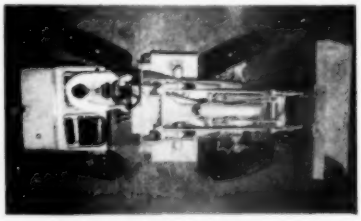
A new trailer unit for hauling sand, gravel crushed rock and cement, introduced by Fruehauf Trailer Co., Detroit 32, Mich. is stated to be particularly suited for serving bins and overhead loading. The new unit comes in both single and tandem axles with respectively 10 yard and 14 yard capacity. The bodies are all high tensile steel and are ribbed and braced vertically by triangular pressed steel posts, and diagonally by struts and gussets. Reinforcement is provided by transverse steel channel cross members and stays. The dump gates are of sand-tight construction. Separate trip mechanism is provided on the gates of each hopper. Dumping is in windrows ready for quick leveling.



New Fruehauf Trailer

Loader Has 7½ Ft. Turning Radius

A new materials handling Shoveloader, announced by Baker-Lull Corp., 314 W. 90th St., Minneapolis, Minn., uses the same steering principle as a hook-and-ladder fire truck to turn sharp corners despite its 19-foot length. The Shoveloader has an inside turning radius of only 7 ft., 6 in. Equipped with positive four-wheel drive and designed to eliminate need for a center differential in the transfer case, the unit's hi-flotation tires and high under-clearance are stated to permit efficient operation of the loader under extreme conditions of mud, snow, sand and uneven ground, the manufacturer states. Power steering on all four wheels (optional) adds to operator's control.



Overhead View of Shoveloader

Open Bowl Self-Propelled Scrapers

Two new open bowl Terra Cobra self-propelled scrapers have been announced by Wooldridge Manufacturing Co., Sunnyvale, Calif. Model TH-090B has a heaped capacity of 15.0 cu. yd., struck capacity of 12.2 cu. yd., and is powered by a Cummins diesel engine of 180 HP. Model TH-090 has capacities of 13.5 cu. yd. heaped, 10.2 cu. yd. struck, and has a 165 HP Cummins diesel engine. Basic design characteristics are similar to the 18 cu. yd. 225 HP Model TH-0142, including new open bowl design, positive hydraulic steering, air actuated direct connected power control unit, "boiling bowl" loading system, positive "Roll-Out" ejector, and 11 in. base diameter vertical oscillating king pin coupling between scraper and tractor units. Both models are said to feature high ground clearance under scraper and tractor, wide apron opening, short turning radius, low center of gravity, and high degree of stability in all turning positions.

Terra Cobra Model TH-090B

NO TIME LOST!
LOADING OR LAYING ITS LOAD
A STANDARD STEEL PRESSURE DISTRIBUTOR GIVES EQUAL CIRCULATION THROUGHOUT THE SPRAY BAR FOR A UNIFORM SURFACE FROM CURB TO CURB FOR LONGER WEAR
STANDARD STEEL
PRESSURE DISTRIBUTOR
The Model 424 can be loaded in quick time for a "fast getaway". A two-way cleaning system guarantees a clean spray bar at the end of the day. First, the material is sucked out of the bar and back into the tank. Then by turning one small valve, cleaning solvent is released into pump and spray bar (without contaminating the asphalt in the tank). No time lost in tinkering — no time lost in loading — Standard Steel 424 keeps going all day long far ahead of the "gravel gang"
WRITE FOR CATALOG 424
OTHER PRODUCTS OF STANDARD STEEL
Maintenance Distributors, Tar Kettles, Patch Rollers, Supply Tanks, Tool Heaters, Asphalt Tools, Street Flushers, Construction Brooms.
Built to the Highest
Standard
Standard Steel Works NORTH KANSAS CITY, MO.

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OVERMAN'S STONE AND BITUMINOUS SPREADER

. . . has all you want in a paving machine.

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ADJUSTABLE . . . divided screed gives either crown, inverted crown or level pavement. Lays any width strip with perfect match to adjoining strip.

SPEED . . . lays up to 8 tons in 30 seconds.

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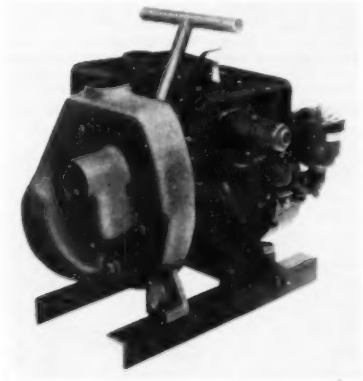
BOX 203 MARION, IND.

Portable Centrifugal Pump for Contractors

A new automatic self-priming portable centrifugal pump for contractors and construction use is offered by Kenco Pump Co., 1125 North Ridge Road, Lorain, O. This new 114 portable pump is completely self-priming, yet has no valves or moving parts other than the motor, pump impeller, and seal. It is stated to deliver over 100 gal. per minute at lowest head, and is capable of forcing water to a maximum height of 100 ft. High suction lift is assured up to and including 25 ft. of lift. The pump has an open-faced, non-clogging type impeller. It will handle all of the solids passed by the Kenco suction strainer affixed to the end of suction hose. The pump is powered by the newly redesigned Briggs & Stratton 1½ hp engine.



Model 114 Kenco Pump

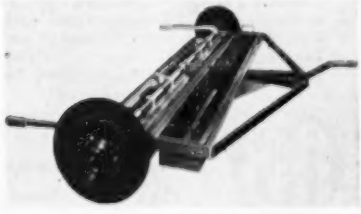
Water Separator and Fuel Filter

A new patented filter claimed to remove 100% of water from diesel and other fuels is being introduced by the Fram Corporation, Providence 16, R. I. The new unit stated to function entirely different from any fuel filter yet developed, is the Fram water separator and fuel filter. The water separator and fuel filter is a combination unit mounted in series consisting of a fuel filter and water separator unit. Both filters use replaceable cartridges. The fuel filter unit is stated to filter out dirt, rust, and other solid contaminants down to 1 micron (.000039") while condensing water in the fuel into large droplets. Then the clean fuel passes through a connecting nipple into the water separator unit. Water collects on the outside surface of the separator cartridge, and drops into the sump. Water is easily removed from the filter sump by a drain valve. By the time the fuel reaches the outlet of the second unit, the fuel is stated to have been micronically filtered free from solid contaminants, and 100% of water has been removed. The unit works equally well on both fresh and salt water.

Fram Water Separator and Fuel Filter Combination Unit

Magnetic Road Sweeper

A new magnetic road sweeper, announced by The Homer Manufacturing Co., Inc., Dept. 253, Lima, O., employs powerful Alnico permanent magnets to pick up tramp metal. The sweepers are self-con-



Homer Magnetic Road Sweeper

tained. They are available in 4 sizes, with effective sweep widths of 48 in., 60 in., 72 in., and 96 in. Each model is equipped with built-in receptacle into which recovered tramp metal is stored until the end of the sweep. Sweepers are furnished with a trailer hitch which is easily attached to towing vehicle.

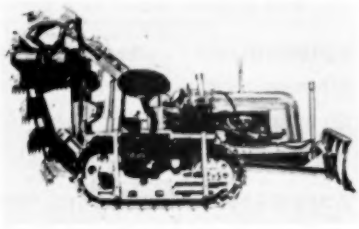
Truck Crane-⅜ Yd. Shovel

An all-new, low priced model has been added to the line of Lorain Moto-Cranes of Thew Shovel Co., Lorain, O. Like other Lorain Moto-Cranes, the new MC-104 is not limited to lifting crane service only. It is fully convertible to a ⅜ yd. shovel, hoe, clamshell and dragline. One of the outstanding features of this model is a completely new, rugged 3-axle carrier, designed by Thew-Lorain engineers and built in Thew-Lorain plants. Side frames are 15 in. deep with massive front bumper and cross bracing built into the frame as a single weldment. It's equipped with a 6-cylinder, 112-H.P. Ford motor and has 8 forward speeds up to 45 mph and 2 reverse speeds. Power is applied to both rear axles to provide a 6 x 4 carrier. A 2-piece, 25-ft. butt flange-connected type crane boom is standard. The hoe boom, narrow and of gooseneck design for better visibility, is 14 ft. long, has a 5 ft. stick and a ⅜ yd. bucket that, with removable side cutters, will dig a trench 24 in. wide and 13 ft. deep. The ⅜ yd. shovel boom is 14 ft. long with a 12 ft. 7 in. stick and of independent, positive, cable-crowd type. Dipper trip is power operated.

New 6-Ton Lorain "TL" Moto-Crane, Model MC-104

Tractor Mounted Trenching Machine

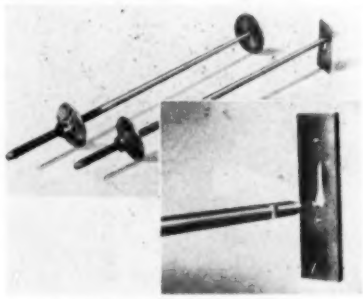
A new trenching unit, announced by Heller Engineering & Mfg. Co., 11752 South Alemeda St., Lynwood (Los Angeles County) Calif., is specifically designed for mounting on the Oliver "OC-3" crawler tractor. Features include 4-ft. depth of excavation, digging width control with bolt on clearance teeth, six digging speeds, adjustable and reversible soil conveyor, hydraulic control for fingertip operation, safety clutch and hydraulically-controlled backfiller blade. The trencher mounts the tractor with perfect balance and the side mount for the operator with his controls readily at hand is stated to assure perfect operator vision and straight-line trenches without operator fatigue.



Model 3A-48 Universal Trencher

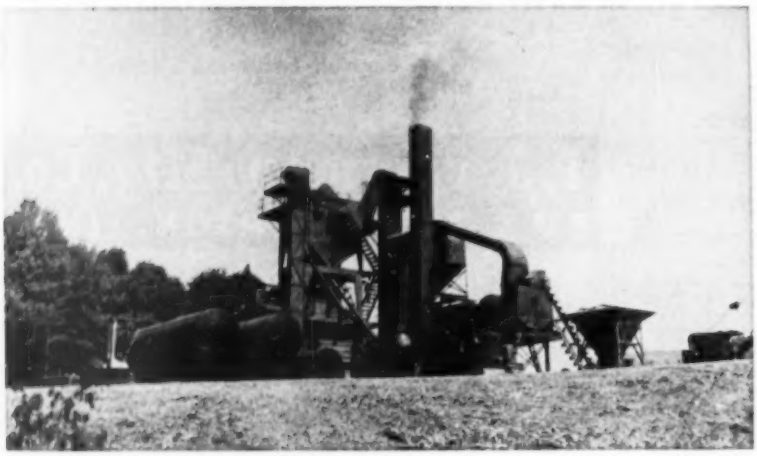
Taper-Tye Concrete Form Clamp

A new Taper-Tye concrete form clamp, announced by H. J. Krueper Co., 535 So. Clarence St., Los Angeles 35, Calif., is claimed to insure quick make-up and fast stripping. The clamps feature a tapered rod which enables rods to be quickly driven from the concrete, requiring only a light tap with a single jack hammer. Formerly threaded on both ends for attaching washers, a new type has now been introduced which utilizes a fast-assembling keyplate on the small end instead of a threaded washer. The rod is slotted on opposing sides of the small end. Keyplate is equipped with an inverted keyhole which slides over the rod and drops into the slots, locking in place. Tapered edges of the keyhole itself prevent binding in the slots upon removal. Keyplate construction is stated to eliminate make-up, insure fast stripping after the concrete is poured and eliminate all re-make-up time.



Taper-Type Concrete Form Clamp

The New, Improved
H & B TYPE "T" Asphalt Plant



Outstanding Efficiency In Both Production and Maintenance

Here, for the first time, is an asphalt mixing plant that gives you—in the basic plant—all of the major improvements and refinements of the past twenty years. An entirely welded structure, with no rivets and only a few bolts. Also, much of the loose bracing and miscellaneous pieces have been eliminated, making it possible to provide adequate working space and platforms with a minimum of pieces to move.

Other improvements include: all overflows are self-contained and internal in the bin; self-contained dust bin, which is an integral part of the bin structure; elimination of the screw conveyor normally used to feed dust into the aggregate weigh-box, thereby making possible a lower original investment in plant, and assuring lower maintenance costs and decreased possibility of breakdown.

This new Type "T" plant has already proved its dependability and efficiency, with outstanding records in both production and maintenance. Available with all units driven by individual electric motors and completely wired, with gasoline or Diesel engines on the main units and electric drive on the smaller units, or with gasoline or Diesel drive throughout. Complete information will be furnished on request.

H&B ESTABLISHED 1907

HETHERINGTON & BERNER INC.

America's First Builders of Asphalt Mixing Plants

721 KENTUCKY AVENUE INDIANAPOLIS 7, INDIANA

American Bitumuls Establishes Eastern Office: The American Bitumuls & Asphalt Co. has established an eastern division office at 10 East Fayette St., Baltimore, Md. The office will be headed by L. P. Street, vice president in charge of eastern marketing. M. A. Ernst will be staff assistant. The office will also be headquarters of A. McGregor, manager of eastern production, and R. P. King, supervisor of Laykold sales.

Sutherland Made District Manager: W. P. Sutherland has been appointed district manager of a newly created Euclid territory in the middle west by The Euclid Road Machinery Co., Cleveland, O., Division of General Motors Corporation. His headquarters will be in Chicago. Euclid sales activities in Minnesota and the Upper Peninsula of Michigan outside the Iron Range will be handled by W. R. Brown, Euclid district representative, who succeeds Sutherland in that region.

Tanner Elected Vice President: Robert E. Tanner has been elected vice president and general manager of Carver Pump Co., Muscatine, Ia. He also assumes the post of general sales manager. He formerly was vice president of the National Can Co.

SIMPLE TESTS

(Continued from page 75)

frequent spot checking on individual shipments of cutbacks or emulsions.

In the field, cutbacks or emulsions will be applied directly from the transport or distributor rather than go through an intermediate storage tank. The Supervising Engineer's inspector will be required to periodically sample material from the distributor and check for uniformity of supply and contamination by running a Saybolt viscosity in the field laboratory. Also retain samples will be taken from the distributor periodically for complete analysis by an off-the-site commercial testing laboratory for a check against the refinery analysis. The frequency of this periodic sampling will depend on uniformity and history of supply. A Miller-Warden Associates representative will keep the Supervising Engineer informed as to the desired frequency.

Miscellaneous Asphaltic Materials. Materials such as waterproofing compounds, joint sealer, cold mix asphalt and liquifiers, etc., will be subject to inspection and/or acceptance by certificate of analysis. The contractor is to follow a prescribed procedure for informing all interested parties with regard to such purchases with an additional copy of all forms, questionnaires, etc., to be sent to Miller-Warden Associates Swarthmore office.

Test Procedures. The test procedures to be used in the field are:

Penetration
AASHO designation T 4952
(ASTM designation D 5-52)

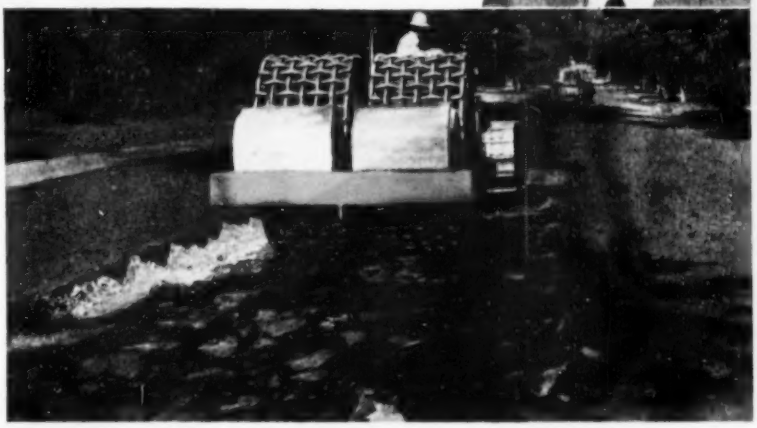
Cleveland Open Cup Flash
AASHO designation T-4846
(ASTM designation D 92-52)

Saybolt viscosity
AASHO designation T 72-46
(ASTM designation D 88-44)

"Best machine made for

SALVAGING BLACK TOP"

says Ben Harrison, Manager,
Petroleum Sales Co., Fresno, Calif.
(Division of Fortier Transporation)



HYSTER GRID ROLLER offers proved performance on bituminous salvage jobs

Reclaiming the material in a 20-year old black top street in Fresno, Calif., would be a tough job for most equipment.

A Hyster® Grid Roller, operating at the fastest speed of the towing equipment, reduced the scarified black top to original aggregate size in just 5 passes per section. *All* of the old aggregate was saved for reuse. By utilizing the live oil remaining in the aggregate, only 3 quarts of SC-3 oil per sq. yd. was needed in the new mix.

The Grid Roller was also used to compact the base and roll the new surface, thus reducing the amount of equipment needed on the job.

Compare this with the inefficient, costly methods that are ordinarily employed on road reclamation.

Said Ben Harrison, Manager of Petroleum Sales Co., Fresno, Calif., contractor on the job, "The Hyster Grid Roller is the best machine we have ever found for pulverizing and laying down bituminous pavement."

The fast, economical Hyster Grid Roller Method of bituminous salvage can help you repair and rebuild more miles of road this season. Your budget dollars will go further. Ask your Caterpillar®-Hyster Dealer for details, or write to: Hyster Company, 2995 N. E. Clackamas St., Portland 8, Oregon; 1895 N. Adams St., Peoria 1, Ill.

HYSTER COMPANY

Only a few passes are needed to reduce scarified chunks to original aggregate size

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Proof of Forke Brothers' skill at getting ACTION through a PLAN of AUCTION is found in the fact that during 1953, this firm sold over 3,000 major pieces of equipment, plus innumerable smaller items, all at top prices.

Forke Brothers handle all details, including advertising and promotion, actual selling, and complete clerking.

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HOW TO DESIGN A PRE-TENSIONED BONDED

Prestressed Concrete Beam

This article was prepared in collaboration with John A. Roebling's Sons Corporation from guiding calculations by H. Kent Preston, Assoc. Mem. ASCE, Engineer of the Construction Materials Division of this company, which manufactures wire products and has pioneered prestressed concrete design in this country, using American methods.

By V. J. Brown, C. E.
Vice President, Gillette Publishing Co.

PRESTRESSED concrete beams placed side by side form a slab for a bridge floor. They can be used also as simple beams for support of framing loads.

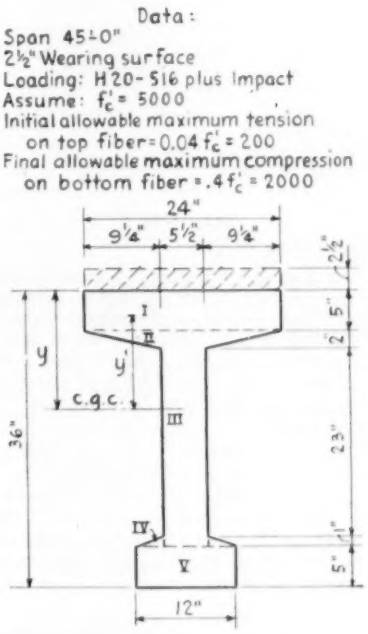
Economic calculations of design ideas may indicate that it is cheaper in a floor or slab design to space T-beams or modified I-beams a little distance apart, rather than butting the edges of the beams together, thus forming a composite slab rather than a simple beam-top slab. To obtain the most economical design of floor slab, several designs will have to be calculated.

It will be the function of this article to explain how to design a pre-tensioned bonded prestressed concrete beam.

Differences Between Types

In general, there are two types of prestressed concrete: (1) *Post-Tensioned* and, (2) *Pre-Tensioned*. How to design a *post-tensioned* prestressed concrete T-beam was discussed by the writer in ROADS AND STREETS, June, 1951. In the *post-tensioned* type of construction the T-beam is poured within the forms in which the necessary shear and other reinforcement has been placed along with a duct containing the unstressed prestressing strands or wires. The concrete is allowed to set and reach a predetermined compressive strength before the strands or wires are tensioned. Post-tensioned strands or wires are *not* bonded to the concrete of the beam. The ducts, are sometimes filled with grout after tensioning is completed.

In the *pre-tensioned* type of construction the strands or wires are tensioned in the forms prior to the pouring of concrete and the tension held until the hardened concrete reaches a predetermined compressive strength. Shear bars are also used in these beams, as well as flange reinforcing. The hardened concrete bonds with the pretensioned strands.



★ Fig. 1—Selected cross-section of modified I-beam

Design Data

After some rough calculations have been made as to waterway required for a bridge, for example, the span can be established. The loading, span, allowable compressive strength for concrete, and wearing surface thickness are adopted as follows:

Span = 45'0"; Wearing surface = 2½" thick; Loading = H20-S16 plus impact; f'_c = 5000 lb./sq. in.; Initial maximum tension in the top fiber of the beam = 0.04 f'_c = 200 lb./sq. in.; Final maximum compression in the bottom fiber of the beam = 0.4 f'_c = 2000 lb./sq. in.

The next step is to assume a cross-section for the beam. Several attempts may have to be made before the economic cross-section is obtained. For the purpose of demonstrating design procedure the modified I-beam section shown in figure 1 was selected.

Step by Step Procedure

The actual design calculations are shown step by step.

Step No. 1—Calculate the properties of the precast section.

Step No. 2—Calculate the dead load stresses without consideration of pre-stressing.

Step No. 3—Calculate the live load stresses in top fiber and in bottom fiber of beam without consideration of pre-stressing but taking impact into account. Impact value is established by code formula.

Step No. 4—Calculate total stress in bottom fiber due to dead load and live load. Calculate maximum stress allowable in top fiber, from code requirement or design criteria.

Step No. 5—Set up equations of stress involving initial pre-stress load and final condition of pre-stressed

Those who are particularly interested in this subject should get a copy of Title No. 49-7, Journal of the American Concrete Institute; on proposed standard definitions and notations for prestressed concrete. It is part of a Report of Joint ACI-ASCE Committee 323. It is recommended also that you get a copy of "Engineering Data Sheet PC-921" from John A. Roebling's Sons Corporation, Trenton, N. J.; "Prestressed Concrete Bulletin" of American Steel and Wire Co., Cleveland, Ohio; and a copy of "R/C, Bulletin No. 27" Portland Cement Association, Chicago 10, Ill.—Editor.

load. These are equations (1) and (2). The first one is set up to check the critical point in the top fiber at end of beam where the average pre-stress load on the concrete minus the stress caused by initial pre-stressed eccentric loading cannot exceed code or design criteria requirements, i.e., 0.04 f'_c.

The second equation is set up to check the stress in the bottom fiber under the final condition, i.e., the final stress due to live load plus that due to dead load must equal the average unit stress in the concrete due to final pre-stress plus that due to eccentricity of final pre-stress.

Step No. 6—From equations (1) and (2) calculate F.

Step No. 7—Having calculated F, we next calculate the number of pre-stressing steel strands to use. The calculations will give a figure that usually must be changed in order to obtain symmetry in design. Having adopted a certain number of strands, the new F obtainable is calculated from which the eccentricity is also calculated.

Step No. 7—Having calculated F, requires a recalculation of stress in the top and bottom fibers of the beam to see that design criteria are met, and with which stress diagrams may be drawn.

Step No. 9—Next the *horizontal shear* at the c.g.c is checked for necessity of using shear bar reinforcement. If stress is less than that allowed by code requirements or design criteria, no stirrups are required.

The *diagonal tension* (f_t) is calculated from the horizontal shear (v). Since prestressed concrete is not allowed to go into tension, f'_t is always a compressive stress. When the point under consideration for f'_t is the c.g.c at the support, f'_t equals $\frac{F_u}{A_c}$. When it is some other point, f'_t can be found by plotting a stress diagram for the beam at the point under consideration and reading the stress from the diagram; or by computation using similar triangles.

Criteria have been established for the *cracking load*. So we calculate the amount of stress that would be required to produce a crack. If the stress indicated by the design criteria formula is less than what would be required to produce a crack the beam is safe against cracking. However, cracking load is losing its importance as a factor in design.

Ultimate bending moment is also established by criteria. If the calculated ultimate bending moment of the actual design is greater than the design criteria formula requires for the minimum, then the beam is safe.

Step No. 10—Complete the design by installing diaphragms and reinforcing steel in the flanges.

Step No. 1

Properties of Precast Section

For notations, descriptions and design criteria, see paragraphs at end of article.

From figure 1 we obtain the table, "Properties of Precast Section."

$$\bar{y} = \frac{5090}{344.8} = 14.76''$$

$$I = 126{,}553 - 344.8\,(14.76)^2 = 51{,}435 \text{ in.}^4$$

$$Z_t = \frac{51{,}435}{14.76} = 3{,}485 \text{ in.}^3$$

$$36'' - 14.76'' = 21.24''$$

$$Z_b = \frac{51{,}435}{21.24} = 2{,}422 \text{ in.}^3$$

Step No. 2

Dead Load Stresses

These are obtained by calculating the self weight of the beam, adding to it the weight of the superimposed pavement, obtaining the dead load bending moment by formula and from it determining the dead load stresses in the top fiber and bottom fiber of the beam:

$$w_G = \frac{344.8}{144} \text{ x } 150 \text{ lb. x } 115\% = 413 \text{ lb./ft.}$$

(144 sq. in. = 1 sq. ft.; concrete weighs 150 lb./cu. ft.; 115% allows for weight of diaphragms)

$$w_s = \frac{2\frac{1}{2} \text{ x } 24}{144} \text{ x } 140 \text{ lb.} = 58.3 \text{ lb./ft.}$$

$$w_D = 413 + 58.3 = 471.3 \text{ lb./ft.}$$

$$M_d = \frac{(w_D)l}{8} = \frac{(471.3 \text{ x } 45) \text{ x } 45}{8} \text{ x } 12 = 1{,}432{,}000 \text{ (in. lbs.)}$$

$$f^t_D = \frac{\text{Dead load moment}}{\text{Section modulus}}$$

$$= \frac{1{,}432{,}000}{3.485} = 410 \text{ psi. (lb./sq. in.)}$$

$$f^b_D = \frac{1{,}432{,}000}{2{,}422} = 590 \text{ psi. (tension)}$$

Step No. 3

Live Load Stresses

The loading adopted for this bridge is the American Association of State Highway Officials standard H20-S16, for a 45 ft. span. The live load bending moment for this span and loading (M_L) has been calculated to be 538.7 k ft. (kip-feet). See page 241, Appendix "A", AASHO Specifications for Highway Bridges, 1949. (It could be pointed out that this figure is very conservative when compared to the table on page 139.) A "kip" is 1,000 lb.

$$\text{Impact} = \frac{50}{L + 125} = \frac{50}{45 + 125} = 0.294. \text{ Use } 30\%.$$

M, due to live load plus impact equals 538.7 x 1.30 = 700 k ft. per lane.

Since we are designing for a single beam, and we generally assume a lane load is carried for 8 ft. of bridge width, this beam width is only 0.25 of the width of a single lane. When more than one member makes up a lane width, the amount of load carried by each member usually becomes slightly greater than the ratio of its flange width to the total width. This is particularly true if there is a spacing between flanges, as for a composite beam. In actual practice the proportion of the lane load carried by each beam is quite arbitrary and depends largely on the attitude of the engineer in charge of the work. The John A. Roebling's Sons Corporation's engineers state that a test program is now being conducted to determine what portion of a lane load is carried by each member in a bridge made up of numerous members, but the results will not be available for about a year.

For this beam we shall increase the 0.25 arbitrarily to 0.27, in line with common practice and the conditions of construction, and get, 0.27 x 700 k ft. = 189 k ft. Hence, the live load stress in the top fiber,

$$f^t_L = \frac{\text{Live load moment}}{\text{Section modulus}} = \frac{189 \text{ x } 1000 \text{ x } 12}{3485} = \frac{2{,}268{,}000}{3485} = 651 \text{ psi.}$$

and the live load stress in the bottom fiber,

$$f^b_L = \frac{189 \text{ x } 12{,}000}{2422} = 936 \text{ psi.}$$

The 1000 x 12 reduces the kip-foot unit to the pound-inch unit.

Step No. 4

Governing Stresses

Bottom Fiber.—The *total compressive stress* required in order to exactly neutralize the calculated simple

PROPERTIES OF PRECAST SECTION

Piece No.	Size in in.	A	y_t	Ay_t	Ay^2_t	I_0
I	5x24	120	2.5	300	750	250
II	9¼x2	18.5	5.7	105	601	4
III	5½x26	143	18	2,574	46,332	8,056
IV	3¼x1	3.3	30.7	101	3,100	....
V	5x12	60	33.5	2,010	67,335	125
Total		344.8 = A_c		5,090	118,118	8,435
					8,435	
					126,553	

beam tensile stresses in the bottom fiber equals 590 psi. + 936 psi. = 1526 psi.

Top Fiber.—The stress in the top fiber will be governed by the condition at the end of the beam (where $M_D = 0$) and will be limited to a maximum of 0.04 f'_c. This is a code requirement.

$$0.04\, f'_c = 0.04 \times 5000 = 200 \text{ psi. (tension)}$$

Step No. 5

Initial prestressing load is always increased over the final or resultant prestressing load because of creep, for pre-tensioned design in the amount 20 per cent. So we multiply the prestress load, F, by 1.20 in calculations of initial stress conditions.

Initial Condition.—The initial condition of unit stress in the top fiber at the end of the beam (—200 lb./sq. in.) may equal but not exceed the difference between the unit prestress (initial) in the beam and the unit stress in the top fiber due to eccentricity. Therefore,

$$\frac{1.20F}{A_c} - \frac{1.20Fe}{Z_t} = -200 \qquad (1)$$

Final Condition.—The stress in the bottom fiber will be governed by the stress conditions existing at the center of the beam, hence

$$\frac{M_D}{Z_b} + \frac{M_L}{Z_b} = \frac{F}{A_c} + \frac{Fe}{Z_b}$$

$$\text{Since } \frac{M_D}{Z_b} + \frac{M_L}{Z_b} = 1526,$$

$$\text{then } \frac{F}{A_c} + \frac{Fe}{Z_b} = 1526. \qquad (2)$$

Step No. 6

Calculations for Prestress Load

It is now desired to determine what prestress load will satisfy the dead and live load conditions, so we multiply equation (1) by $\frac{Z_t}{Z_b}$ and substitute values for A_c, Z_t and Z_b. The equation is multiplied by $\frac{Z_t}{Z_b}$ because we wish to get Z_b into the denominator of equation (1) the same as it is in equation (2). The value of $\frac{Z_t}{Z_b}$ is $\frac{3485}{2422} = 1.439$. Use 1.44.

$$\frac{1.20\,F}{A_c} \times \frac{Z_t}{Z_b} - \frac{1.20\,Fe}{Z_t} \times \frac{Z_t}{Z_b} = -200 \times \frac{Z_t}{Z_b}$$

$$\frac{(1.20)(1.44)\,F}{344.8} - \frac{1.20\,Fe}{2422} = -288 \qquad (3)$$

Multiplying equation (2) by 1.20 and substituting values for A_c and Z_b, we get

$$\frac{1.20\,F}{344.8} + \frac{1.20\,Fe}{2422} = 1831 \qquad (4)$$

Adding equations (3) and (4) we get

$$\frac{2.9\,F}{344.8} = 1543, \text{ from which}$$

$F = 183{,}457$ lb. Use 183,460 lb.

Step No. 7

Calculation for Eccentricity

This is the point in the design where the designer finally decides on the strength of concrete he wishes to use and the size and number of strands. How the curing is to be effected and what the pouring schedule is to be are factors that are also considered at this point.

The concrete mix should be designed to produce a strong concrete with a high bond value in the shortest possible time, thus giving maximum production for a given casting bed. Some plants release the strand load into the newly cast member after 20 hours, thus pouring once a day. Others wait 40 hours and pour every second day, while others wait 64 hours and pour every third day.

Aids to high early bond are:

1. A very dry mix with air entraining cement.
2. Use of internal and form vibrators.
3. Steam curing.
4. Low water-cement ratio.

There is very little information on the minimum strength of concrete needed to bond the various sizes of strand. Comprehensive and severe tests have been conducted on the 5/16" dia. stress-relieved strand in 5,000 psi. concrete and they show that satisfactory bond is developed. Based on present experience, Roebling engineers use the following rule of thumb for minimum concrete strengths to develop satisfactory bond on stress relieved strands:

¼" dia. strand—4,000 psi. concrete
⅜" dia. strand—4,800 psi. concrete
⅜" dia. strand—5,500 psi. concrete

These concrete strengths are those at the time the member is put in service—not at the time it is removed from the form.

Knowing the stressing load required and also, from manufacturers tables, how much load each wire or each strand is designed to carry safely, we can calculate the number of strands required to satisfy our theoretical design. Hence—

Using 5/16" diameter Roebling strands, we divide (F) 183,460 by 8,400 lb. per strand (See Roebling Catalog T-920) and get 21.81 strands required. For symmetry we select 22 strands and recalculate a new value for F. In other words, we recalculate the new F in order to determine what the eccentricity must be. Hence the new F will be 22 x 8,400 (using Roebling's standards) = 184,800 lb.

From equation (2), $\frac{F}{A_c} + \frac{Fe}{Z_b} = 1526$.

Substituting values we get (using the slide rule to make calculations),

$$\frac{184{,}800}{344.8} + \frac{184{,}800\,e}{2422} = 1526$$

$$538 + 77\,e = 1526$$

$$e = \frac{988}{77} = 12.7"$$

Placing Steel.—The following rule-of-thumb method has been suggested for establishing the minimum spacing of bonded strands:

Draw a square around each strand. The area of this square should not be less than the tensioning load in the strand divided by the ultimate strength of the concrete. The strands should be so spaced that these squares do not overlap each other. The minimum distance from the edge of the strand to any concrete face should be three-fourths of the distance across the square. Minimum spacing is often determined by the size of the temporary fittings used to tension the strands.

Step No. 8

Recalculated Final Condition

Now that we have a final loading F (184,800 lb.) stresses in the top and bottom fibers of the beam must be recalculated. For this final condition

$$f'_t = \frac{184{,}800}{344.8} - \frac{184{,}800 \times 12.7}{3485}$$

$= 539 - 676$ (Using slide rule.)

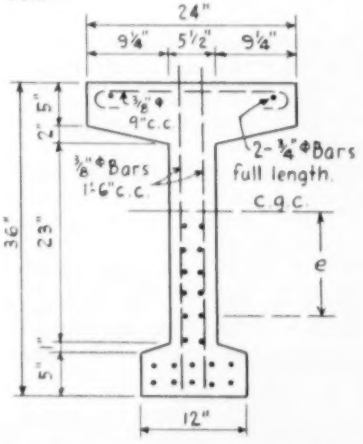
$= -137$ psi (tension) This fig-

1- Span 45'-0" with solid diaphram 6" thick at ⅓ points and 3'-0" deep at each end. Over all length 47'-0".

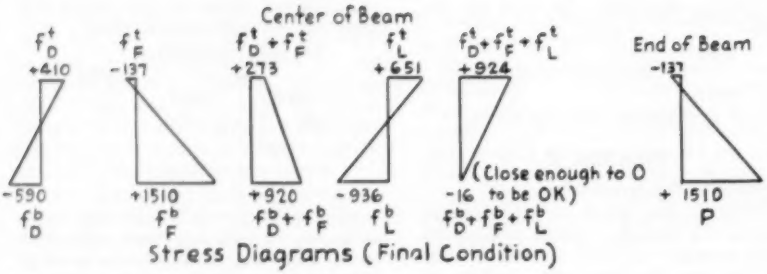
2- Loading: H20 - S16 with impact.

3- Design for a 2½" thick bituminous wearing surface on top.

4- Two 3¼"ϕ lateral holes to be cored in each diaphram transversely of beam.



★ Figure 2—Cross section of modified I-beam with pre-tensioned prestressed steel strands placed



★ Figure 3—Stress Diagram (Final Condition)

ure can show tension not to exceed 200 psi. (— 200).

$$f^b_F = \frac{184{,}800}{344.3} + \frac{184{,}800 \times 12.7}{2422}$$

$$= 539 + 971 = 1510 \text{ psi (compression)}$$

Stress diagrams for the final condition are shown in figure 3.

Step No. 9

Checking Other Points

Horizontal shear is found and with it diagonal tension is calculated. Horizontal shear will usually be a maximum on the center of gravity of the concrete section at the point of greatest shear. This point, in a simple span is at the supports. In this design the location of maximum shear is assumed to be at the bottom of the top flange, 7" down from the top of the beam, rather than at the c.g.c. If this computed tension stress is greater than 0.04* f'_{cb} (permissible compressive stress), then stirrups will be required to take care of the excess. If this stress is less than allowable, no stirrups are required. However, in general practice, most designers install small diameter rods spaced one-half (½) the beam depth apart, anyway, or wire mesh. Common practice is to extend them for twice the beam depth from the end, because of lack of deflection at the ends. Horizontal shear (v) by formula is

$$v = \frac{V}{I\,b}\,a'y'$$

To obtain V, we must find the shear due to the dead load w_D, and add to it the shear due to the live load plus 30% impact. Shear due to w_D equals 471.3 lb./ft. x 22.5 ft. (half-span) = 10,580 lb.

Live load shear equals 0.27 $\left(\frac{w_L}{2} \times 1.30\right) = 0.27$ (57k x 1.30) = 20,000 lb. Obtain the figure of 57k from page 241, Appendix A of the AASHO Specifications for Highway Bridges dated 1949. The 0.27 figure is the same as used before to reduce lane load to beam load.

V = 10,580 + 20,000 = 30,580 lb.

I = 51,435 in.⁴ (from Properties of Precast Section)

b = 5.5 in. (thickness of section at point under consideration)

a' = 120 + 18.5 + (5.5 x 2) = 149.5 in.² (Area of section above point under consideration, i.e., above bottom of top flange of the beam.)

$$y' = 14.76 - \frac{300 + 105 + (11 \times 6)}{120 + 18.5 + 11}$$

= 11.61" (Distance from neutral axis up to center of gravity of area a'.)

a'y' = 1735.7 in.³

Substituting these values in the above equation, we get

$$v = \frac{30{,}580}{51{,}435 \times 5.5} \times 1735.7$$

= 187 psi (No stirrups required).

If the c.g.c is taken as the location of maximum horizontal shear, similar calculations should be made as a check against the 187 figure.

Diagonal tension is checked by formula using the horizontal shear value at the most critical section. The formula is

$$f_t = \frac{f'_{th}}{2} \pm \sqrt{(v)^2 + \left(\frac{f'_{th}}{2}\right)^2}$$

The figure for f'_{th} is scaled from the stress diagram as 220 psi. Substituting, we get

$$= \frac{220}{2} \pm \sqrt{187^2 + 110^2}$$

$$= 110 \pm 217$$

= 327 or — 107 psi

Diagonal tension of 107 psi is less than the 150 psi allowable, therefore, no stirrups required for this. However, as stated before they are usually employed.

Cracking Load—Design criteria have been established for the cracking load; see Design Criteria for Prestressed Concrete Bridges (Pretensioning Procedure) printed at the end of this article with accepted notations or symbols.

Cracking load minimum = 1.0 f^b_D + 2.0 f^b_L

Allowable tension in bottom fiber = 0.15 f'_c = 0.15 x 5000 = 750 psi

Compression due to "F" = 1510 psi at critical section.

Therefore, a tension stress of 1510 psi plus 750 psi must be applied to produce a crack.

The 0.63 figure is an assumed figure for reducing the calculated live load. Criteria developed for prestressed concrete state that in checking cracking load, the full width of the bridge can be taken as absorbing overload in one lane. The bridge roadway is wider than a multiple of the number of beams and hence more than the width of one beam is absorbing the overload. Consequently the calculated live load stress may be reduced by the amount of distribution of overload to the rest of the width of the bridge roadway. The 936 psi. figure already includes an increased stress of 2% due to extra width when we multiplied the lane load in Step No. 3 by 0.27. In checking cracking load, we may reduce this calculated stress as allowed by the criteria, and for the width of the bridge in this problem, we assumed a figure of 0.63. By criterion

$$1510 + 750 > 1.0\, f^b_D + 2.0\, f^b_L$$

$$2260 > 590 + 2 \times 0.63 \times 936$$

$$> 590 + 1178$$

> 1768.....O.K.

Ultimate Bending Moment—When computing the ultimate bending moment or the cracking load, the live load may be considered as equally distributed over all roadway girders. Impact shall be included in live load factors. A theoretical ultimate bending moment calculation is a complicated elastic stress problem, hence formulae and criteria are established for average use.

Ultimate bending moment minimum = 1.0 M_D + 3.5 M_L or 2.25 (M_D + M_L) whichever is greater.

This formula applies to a beam in which the steel is properly proportioned percentagewise.

The ultimate load allowable per strand, from Roeblings' tables of prestressed concrete strands, is 15,000 lb. for 5/16" strand. Hence

$F_u = 15{,}000 \times 22 = 330{,}000$ lb.

$\frac{330{,}000}{5{,}000} = 66.0$ in.² of concrete area required to balance the ultimate steel loading. Assuming this thrust to occur in an area at the top of the beam, we calculate that

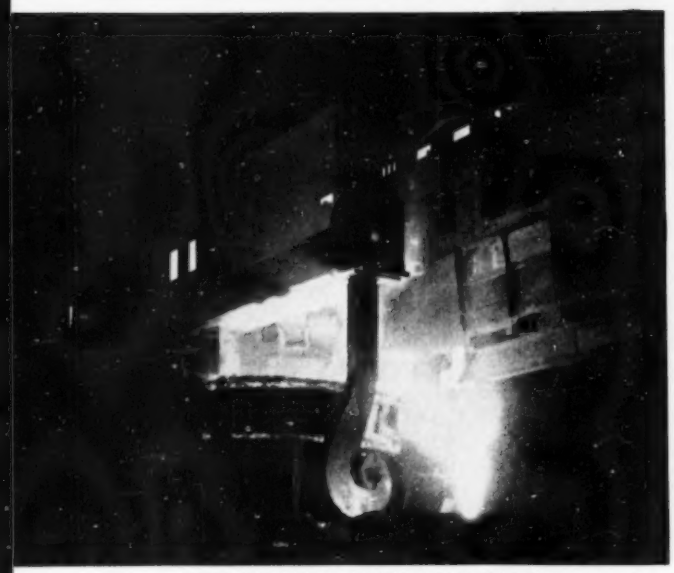
24" x d = 66.0

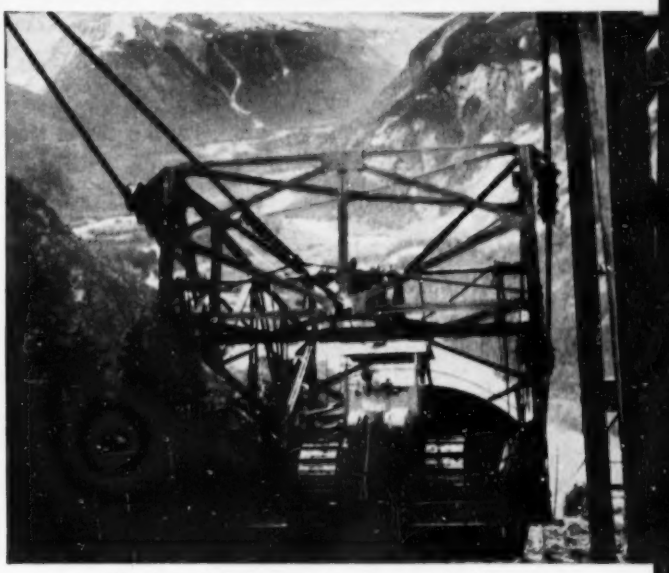
$d = \frac{66.0}{24} = 2.75$" which is the depth of the area.

The center of pressure of this thrust would then occur at $\frac{2.75"}{2} = 1.37$" below top of beam. The lever arm of a couple would then be 27.46 — 1.39 = 26.07", between center of steel and thrust center of concrete, the tensile action of the steel acting at a point 27.46" ($\overline{y}$ + e) down from the top of

(Continued on page 117)

*This figure will vary from specification to specification and is used in concrete with minimum steel. Some designers use 0.06.

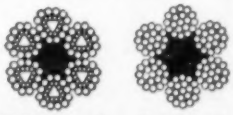




PROVING EXTRAORDINARY SERVICE—A Hercules Flattened Strand crane rope delivered 18 months service, compared to 6 months for ordinary rope. It performed equally well as a clamshell bucket rope. On a hot ladle crane it outlasted round strand rope by 4 to 1, and still tested at higher-than-rated strength. It was chosen for its super strength to haul the car on the continent's largest cableway at Kitimat.

Can Flattened Strand solve your special wire rope problem?

Hercules Flattened Strand is a special kind of wire rope that provides extraordinary service on special kinds of jobs.



Flattened Strand Round Strand

The key to the difference is the triangular shape of the strands. Notice how the strands support each other; how the rope circumference is almost perfectly round; and how the core is smaller. There is 10% more steel in Hercules Flattened Strand than in round strand ropes of the same diameter. That means *10% more strength* and *10% greater safety*. Flattened Strand wears longer and more evenly . . . and is easier on sheaves and equipment.

If you can use this Super-rope, you'll soon begin saving time, labor, money. Why not investigate?

Because Leschen pioneered and perfected Hercules Flattened Strand wire rope, Leschen is your best source of additional information. Ask your Leschen man, or write for "The Flattened Strand Story."

LESCHEN WIRE ROPE DIVISION
The Watson-Stillman Company
(A SUBSIDIARY OF H. K. PORTER COMPANY, INC.)
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LESCHEN
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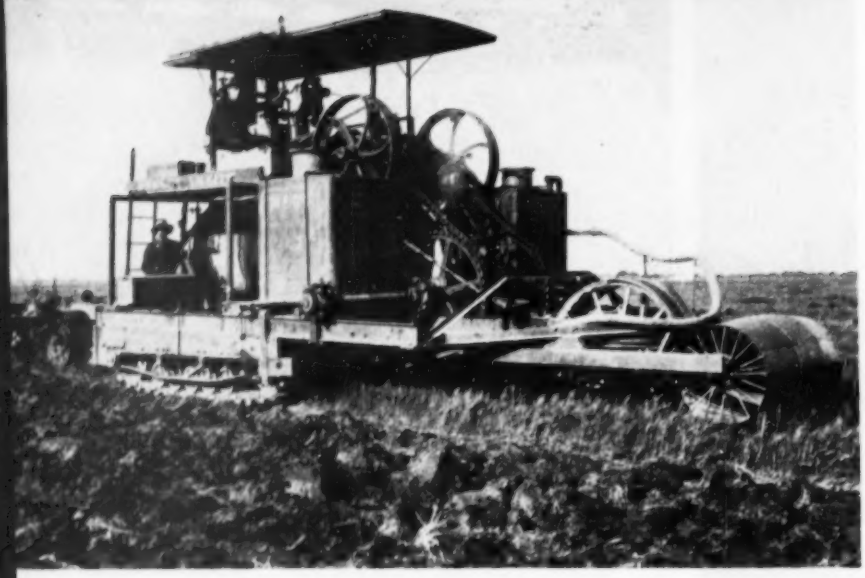


A half century has passed since the crawler idea was born. Industry leaders are paying homage to this mechanical idea which has helped revolutionize roadbuilding, construction, logging and heavy farming.

• World's first practical track-type tractor, originated in 1904, when Benjamin Holt, president of Holt Manufacturing Company, took a standard steam traction engine and replaced wheels with rough tracks.

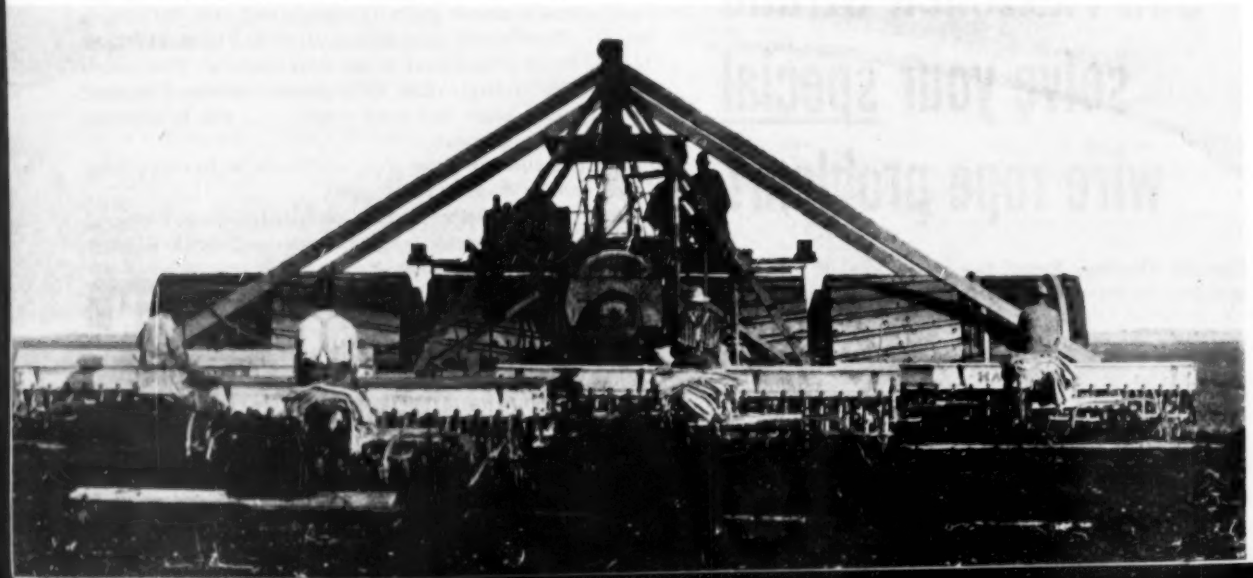
REMEMBER THESE OLD TIMERS?

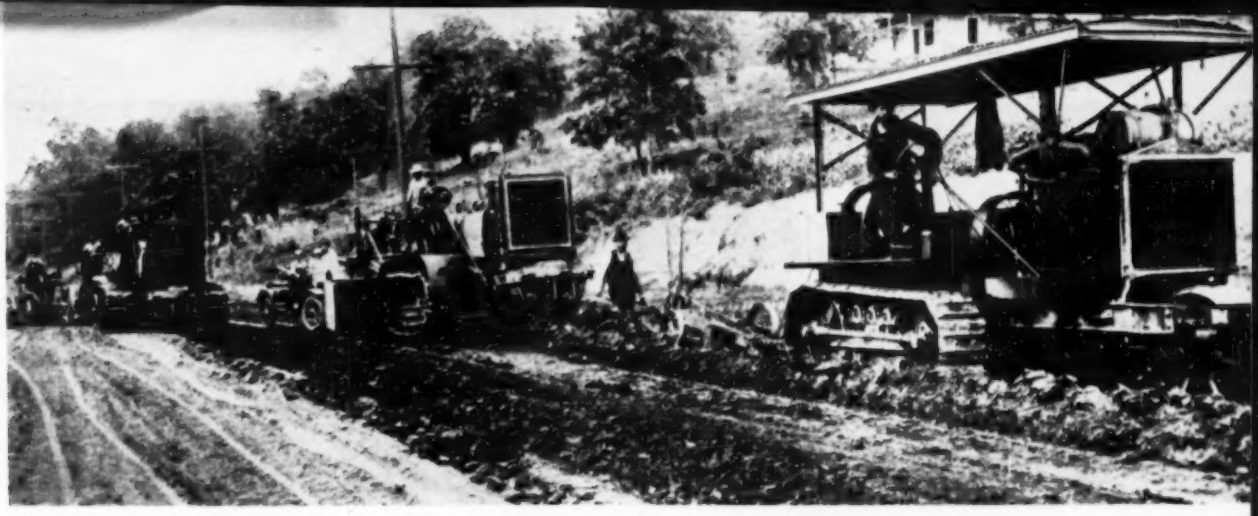
• This steam traction engine, built by the Best Manufacturing Co., one of Caterpillar's predecessors, was hauling cut timber in 1894.

• World's first gasoline crawler was manufactured by Holt in 1906. Here an operator, complete with bowler, is testing Holt's second such unit.

• The first Caterpillar all-track crawler, which eliminated the forward tillar wheel, was built in the Holt company's Peoria plant in 1913.

• Before Holt introduced the first practical crawler, the company tried putting larger wheels on its traction engines to keep them from miring in the soft delta lands of California. This special unit built in 1903 had three 6-ft. wide wheels on either side.





• Typical road building scene in 1917—three Caterpillar track-type tractors working near Peoria, Ill. Crawler in foreground is pulling a road plow; second tractor following with land leveler.

A RECORD of 50 consecutive years of track-type tractor manufacture is being commemorated this year by Caterpillar Tractor Co. It was in 1904 that Holt Manufacturing Co., one of the firm's parent companies, successfully tested the first practical track-type tractor. This machine is the fore-runner of 340,000 non-military crawler tractors of all makes now at work in the U.S. alone, with many others around the world.

As with every invention of fundamental importance, the idea of the crawler was born of necessity. It was first devised to keep farm machinery from bogging in the soft delta soil of California. The Holt firm replaced iron wheels on a steam traction engine with crawlers, after unsuccessfully trying out multiple wide-wheel arrangements. Later in 1913 came their first all-track unit. Then C. L. Best Gas Traction Co., a competitor, entered the field, and soon the construction industry was eyeing the superior tractive power and floatation of such equipment.

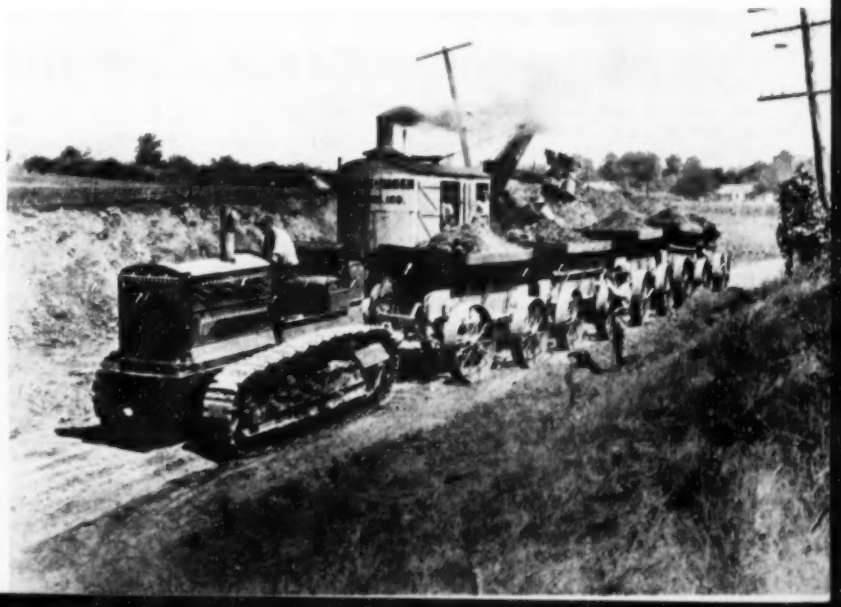
During World War I, the crawler idea inspired the first tanks, which played a victory role.

Diesel-power models appeared in 1931, at which time the horse-and-mule days of construction and earthmoving were already gone. The mechanical refinements since then have been paced by the spectacular development of earth scrapers and other equipment or attachments to utilize crawler-tractor power.

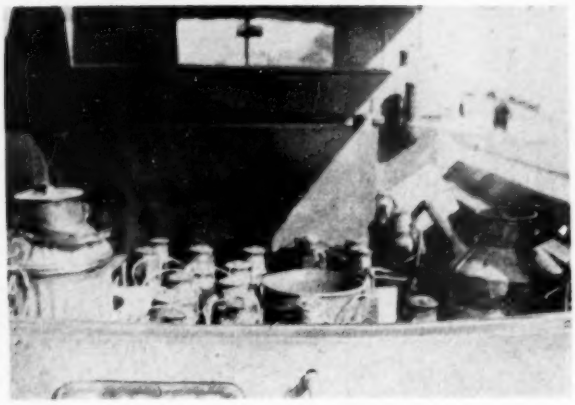
The crawler-mounted dozer literally spearheaded the "construction man's" World War II. Today the skill and acumen of the contractor are centered in capitalizing the productive capacity of wagons, scrapers, blades, pipe layers, loaders, winches, rippers and other units devised around the track-type tractor.

• Earthmoving was speeded by larger scrapers developed to match the crawler tractor. Here two scrapers, pulled by a Caterpillar 5-ton, carve a new road in England in the early post World War I period.

• An old Erie steam shovel loading steel-wheel dirt wagons on an excavating job in Indiana. A Caterpillar 10-ton tractor is seen hauling wagons on this job in the early 20's.



JOB and EQUIPMENT IDEAS



★ Flare truck in Oakland

Service truck for flares

The city of Oakland, California, makes good use of Chevrolet Panel Truck (minus panels) to service lanterns and flares in street excavations. This rig carries tanks of gasoline fuel oil and kerosene—any of which may be drawn from the side of truck as shown. Note grounding chain near right wheel for safety.

Lamps, empty containers ride free of restraint on bed of truck while larger containers fit into brackets as illustrated by can in center background.

"How much per square foot?"

By W. F. Schaphorst, M. E.

Here is a chart that will assist the road builder in quickly determining all sorts of unit area costs: the per square foot cost of special treatment of given road areas; of digging; filling; etc.

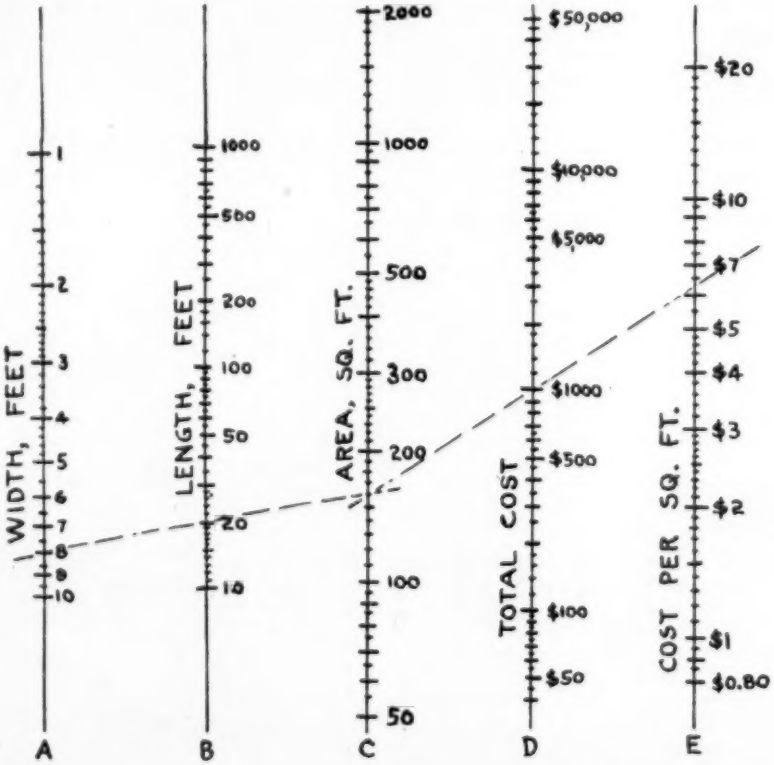
Or, it can help you figure a heavy concrete footing. For example, let us say that you are estimating a footing 8 ft. wide by 20 ft. long. The area is 160 sq. ft. If you pay $1000 rent per year for that space, you are paying $6.25 per sq. ft. per year.

The dotted lines drawn across this chart show how easy it is to solve such a problem. Run a straight line through the 8, column A, and the 20, column B, through the 160, column C, and the $1000, column D, and column E immediately tells you that the cost per sq. ft. is $6.25.

The chart will take care of *any* problem of this sort, regardless of width, length, or cost, by simply adding ciphers. Thus if the width is 80 ft., and the length 200 ft., add two ciphers to the result in column C and the answer is 16,000 sq. ft. And if the cost per year is $100,000, the result is the same as before, namely, $6.25 per sq. ft. The best way to get acquainted with the chart is to work a few problems with it. Many pages could be written about the numerous combinations that are possible, but, after all, the chart is so very simple that you can get the "hang of it" in a few minutes by solving problems that you can do in your head. Then, after that, apply it to problems that you *cannot* do in your head and you will begin to appreciate the chart's value to you.

After computing the cost per sq. ft., ask yourself such questions as these: "How much floor space is that old desk taking up?—the desk we haven't used for five years and will probably never use again?" "How much is that space worth to us per year?" "Are we getting our money out of that space?"

Look around carefully and note whether or not you have anything in your storage room, machine repair shop, or office that is taking up a lot of valuable space and which could be replaced by something that would PAY. An ordinary chair, for instance,



consumes about 4 sq. ft. of floor area. If the space is worth $4 per sq. ft. per year that chair is costing you $16 per year. A cheap table, with nothing worth while on it, may be costing you more than $100 per year, depending on the floor area it consumes and the value of the space.

This chart helps to answer all such problems for the road builder. Spend an evening with it, do some serious thinking and planning, and it may be that hundreds of dollars in real profit will result.

S. Howard Brown heads ARBA contractors

S. Howard Brown, of Brown, Davis and White, Lebanon, Pa., was elected president of the American Road Builders Association Contractors Division, at the ARBA annual meeting at Atlantic City. Other election details for this division:

Vice-Presidents: John P. Moss, Moss-Thornton Construction Co., Leeds, Ala.; L. W. Lamb, Holland, Mich.

Directors (1957): William O. Faylor, Middlecreek Construction Co., Middleburg, Pa.; John R. Slade, engineer-director, Florida Road Builders Association, Tallahassee, Fla.; L. A. Davidson, contractor, Lansing, Mich.; Archer B. Gay, engineer-director, Virginia Road Builders Association, Richmond, Va.; Joseph R. Perini, B. Perini and Sons, Framingham, Mass.; S. C. Austin, manager, Highway and Heavy Div., Carolinas Branch, AGC, Raleigh, N. C.; A. E. O'Brien, executive secretary, Associated Pennsylvania Contractors, Harrisburg, Pa.; E. N. Rodgers, engineer-manager, Alabama Road Builders Association, Montgomery, Ala.

Directors-at-Large (1955): William M. Nanini, President Rock Road Construction Co., Chicago, Ill.; J. B. Michael, J. B. Michael and Co., Memphis, Tenn.; Herbert M. Warren, Warren Brothers Roads Co., Birmingham, Ala.; J. W. Thompson, Thompson-Arthur Paving Co., Greensboro, N. C.; R. W. Hyde, Jr., Hyde Construction Co., Jackson, Miss.; Philip V. Corey, W. H. Hinman, Inc., Portland, Maine; E. B. Cape, President, Gulf Bitulithic Co., Houston, Tex.

Toncan Culvert Association

Lynn J. Busby, of Madison, Wisconsin, has been elected president of Toncan Culvert Manufacturers Association for 1954. Also named were Walker R. Young, of Denver, Colorado, as vice-president; Rex E. Rhine, of Decatur, Georgia, secretary-treasurer; and Hubert E. Snyder, Cleveland, Ohio, managing director.

The foregoing also comprises the Association's board of trustees. The Association's headquarters is 1151 Terminal Tower Building, Cleveland.

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DIGEST of Current Technical Literature

By JOHN C. BLACK, Associate Editor

Quicksand sampled with dry ice

To determine the distance to which approach fills should be carried into the South Canadian River to yield maximum economy of combined bridge and approach construction, the Oklahoma state highway department sampled the river bottom by driving small, open tubes into the sand; driving a larger tube, or casing, around the first; removing the sand and water from the space between the tubes; filling the space with dry ice; and pulling up the smaller tube after its contents were frozen solid. Samples thus obtained disclosed the sand-water relation exactly. In the extreme cases it was approximately 50-50.

George E. McCamy, the department's materials engineer and R. A. Helmer, research engineer devised and conducted these tests, which were reported briefly in THE EXCAVATING ENGINEER *for October, 1953.*

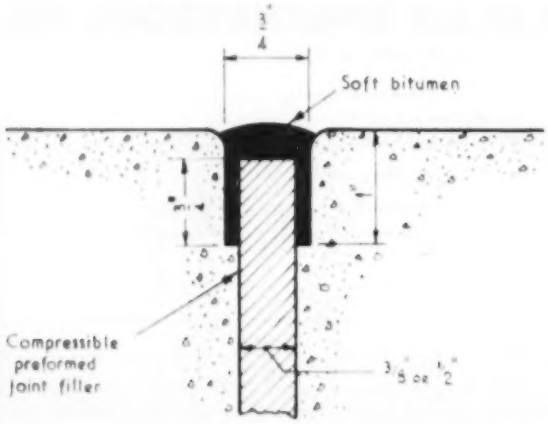
Temporary seal for concrete joints

To protect the edges of joints in newly laid pavement from damage by dirt and debris from adjacent or nearby construction operations, the British have developed the type of seal here shown. It is designed for temporary service to prevent the entry of grit or small stones into the joint, with ultimate edge spalling or other damage. Ordinary seals which are satisfactory on a reasonably clean highway are frequently penetrated, or even torn out, under the rougher conditions of construction traffic. Large scale real estate developments are the most common locations of such trouble.

As indicated in the cross section, the slots for the sealing compound were filled to ¼ in. below the surface of the concrete with strips of fibreboard. The top ¼ in. of the joints was then filled with 300 pen. bitumen which was poured hot into the joints immediately after the strips of fibreboard had been laid. Although the soft bitumen collected a lot of grit it was too shallow to collect stones large enough to cause spalling. It was found that the most suitable shape of the strips for ease of handling and placing was a tapered cross-section, the length of each strip being 18 in.

In a two-year test by the Road Research Laboratory this seal proved definitely superior to four other designs tried. Installation reqiured more care but apparently not so much as to cancel its advantage. All the seals showed good water resistance.

From an article by P. L. Critchell and R. S. Millard in ROADS AND ROAD CONSTRUCTION, *London, December, 1953.*



The "right of access" in law and in morals

An "expressway" obviously requires restriction of access and of crossing, and the owner of property along its route must accept the fact that he cannot enter it at will. Under what circumstances shall the owner be considered as yielding a right for which he should be compensated?

James Hutton and Clarence W. Phillips, both of the Legal Division, U. S. Bureau of Public Roads, have considered this and associated questions (within as well as without urban areas) in a paper in *Traffic Quarterly*, October, 1953, their major thesis being the proposition that the establishment of a limited access highway on a location where highway access or right of access did not previously exist does not entitle the property owner to damages. In other words, the owner should not be paid for something which he never had. The cutting-off of property from an actually existing right requires just compensation, as does, of course any taking of land for right-of-way or other purposes.

Public interests and private interests are considered and weighed pro and con—". . . the avoidance, consistent with natural law and justice of paying damages for not giving free entrance to expressways at all points will promote the economical construction of expressways and so will aid the modernization of the great cities and their adaptation to modern transportation, the expansion of suburbs and of living space within the cities, and hence a better mode of life. These are the stakes involved in the legal problem of dedicating express rights-of-way to special uses and of controlling access at the lowest cost justly owed." A majority of court decisions support this view, but some are counter.

Historically, "Public rights-of-way were created by dedication by the owner and acceptance of the public authorities. A landowner might make a conditional dedication of a right-of-way to the public with reservations and restrictions as to its use. Land might be and frequently was dedicated as a footpath, or a bridleway, or a carriageway, or a driveway, a churchway, a towpath; and, under modern statutes, special roads have been dedicated for fast, through motor traffic. Such dedications were instances of restricted dedication for special uses."

The authors cite much law, both statutory and judicial, recommend certain new legislative measures, and end their paper with six pages of notes on statutes, decisions, and opinions.

Hinged spans for rarely opened bridges

Where provision must be made for the passing of vessels or floating equipment through a bridge at exceedingly rare intervals the cost of any conventional type of movable span may be so far out of proportion with other costs and with benefits as to unbalance an entire economic plan. The state of Florida has developed a solution to this problem which can be applied elsewhere.

Florida's Everglades drainage canals, though not designed for navigation, must provide for occasional movement of dredges and other float-

ing units. The cost of ordinary bascule bridges at highway crossings would be excessive, and sometimes prohibitive. Removable "float-out" spans are objectionable because of the time required for the operation and the difficulty and expense of assembling necessary equipment.

Escape from the dilemma was found in the installation of hinged leaves costing little more than equivalent fixed spans. Neither counterweights nor operating machinery are provided. When a span is to be opened (which may happen not more than a few times in its life) truck or crawler cranes make the lift. Largest of such spans, that in the Kissimmee River bridge, is 28 ft. wide and 41 ft. long from center to center of end bearings—total weight approximately 39,800 lb. Three small truck cranes were employed in the test opening—two on the hinge side and one at the open end to help start the lift and end the closure.

It is estimated that each bridge opening will cost from $200 to $300, depending on the distance from which crews and equipment must be brought. Such amounts are, of course, negligible in comparison with the maintenance and depreciation on any conventional type of drawbridge. Four days notice is allowed to move cranes and prepare for the opening, but the operation itself is generally completed with not more than an hour's interruption of highway traffic.

The hinged spans are of light I-beam construction with open grid deck, and other light weight details. Hinge pins are $2\frac{1}{2}$ in. diameter, set in $2\frac{5}{8}$ in. bearings. When in closed position the span rests directly on its abutments, with no stress whatever in the hinges.

Clearance between fenders on the Kissimmee bridge is 50 ft. to provide for dredge hulls, the smaller opening in the bridge deck being sufficient to pass the dredge superstructure. It is planned that dredges will be snubbed through, using the fenders for moorings.

Synopsis of an article by W. E. Dean, Jr., Engineer of Bridges, Florida State Road Department, in CIVIL ENGINEERING, *October, 1953.*

Pre-cast, post-tensioned tower frames

Two 75-ft. ice plant towers near Sydney, Australia were constructed with precast columns post-tensioned on the Freyssinet system, linked by precast beams stressed after placing.

"Both columns and beams were precast close to the site on a concrete platform about 100 ft. square, where the columns were also prestressed before erection. Inflatable rubber tubes were used to form channels for the

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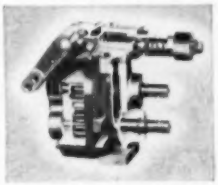
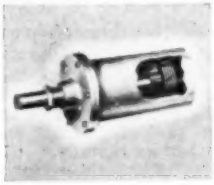
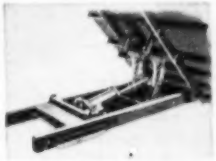
The secret is in the double equalizing lift arms. By carefully designing the curved lift arm tract to the circular path of the rollers, Marion engineers have succeeded in accomplishing outstanding performance. The hoist starts at extremely low oil pressures and continues to lift smoothly without fluctuation or pressure surges even when the loads are retained in the body such as in spreading.



Marion pumps are built to last. Meehanite housing is used with case-hardened gears and shafts. Four anti-friction needle bearings assure smooth performance. Patented valve gives positive control for spreading . . . check eliminates back pressure. Valve action is progressive—raise, hold and lower.



Cylinders are made of seamless steel tubing bored and finished to a glass-like smoothness. There is a bolted leak-proof head. Piston has four iron Graflox-treated quick break-in rings — one ring per groove.



Hoist sub-frame is designed to give increased strength with a minimum of weight. Rear of the frame is enclosed. The point of support at base of cylinder is designed to withstand excessive horizontal and vertical stress.

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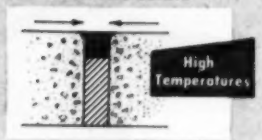

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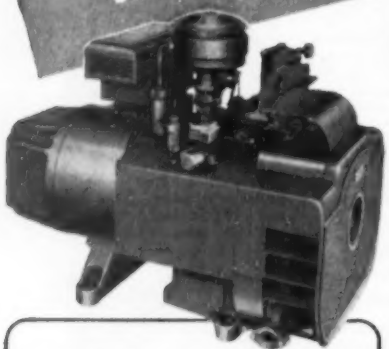

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prestressing cables, which were pulled through the columns by means of a cable sock.

"The twelve columns are founded on twelve piers made from 5-ft. diameter concrete pipes filled with *in situ* reinforced concrete. A well about 5 ft. deep was formed in the top of each pier, to form a socket for the precast column. On completion of the piers the whole foundation area was filled in and the fill compacted to within 8 in. of the top of the piers. An 8-in. thick concrete slab was then cast on top of the fill, flush with the top of the piers and forming the ground floor of the tower.

"The columns were lifted into position with the aid of two lifting poles and wedged in their sockets with wooden wedges, and as winds of up to 70 m.p.h. were experienced during erection, the wedges were supplemented by a filling of sand and weak concrete which was later removed.

"After all the columns had been erected the 30 ft. long beams were lifted into position on the column brackets. Prestressing cables were then threaded through both beams and columns and tensioned, forming beams and columns into a continuous frame. During prestressing the columns were jacked to allow for shortening of the beams, and deflections were measured during and after the operation.

"The third floor beams were tensioned first, followed by the fourth and fifth floors, and the column wedges were then removed to give greater flexibility while the first and second floors were tensioned. On completion of the prestressing the columns were finally concreted into their sockets."

From CONCRETE QUARTERLY 19, *London, July-September, 1953.*

Research on the "alkali-aggregate reaction"

Expansion and pattern cracking in concrete due to the "alkali-aggregate reaction" has been recognized since 1940. Serious damage to pavements and structures—even to the point of total loss—is reported from thirteen widely scattered states, the deterioration generally progressing slowly over a period of years. Although the problem has had intensive study, and a considerable bibliography is given in this report, the process is not fully understood and solutions of the problem are still tentative.

Particles of opal, chalcedony, or certain volcanic glasses appear as the major source of trouble. Certain aggregates are observed to react with any portland cement—others only with cements of relatively high alkali content.

The first and obvious, remedy is the selection of non-reactive materials, the problem in the case of untried

aggregates being to determine the reactive or non-reactive character quickly enough for practical use. Effective with some but not all aggregates is the use of cement of restricted alkali content (See Federal Specifications SS-C-192).

Another solution is found in the use of puzzolanic admixtures whose effectiveness has been proved. Calcined clays or shales, and some fly ashes, as substitutes for from 20% to 30% of the cement have shown good results, though these are not all equally effective, and some have proved actually deleterious.

Experimental work also indicates the practical effectiveness of very small quantities of certain salts and of protein air-entraining agents. Authorities disagree on the effectiveness of conventional air-entraining cements.

For advance determination of alkali-aggregate reaction, the most reliable test is to measure the expansion of mortar prisms in moist storage. Disadvantage is the time requirement, which may run to a full year for conclusive results. Attempts to accelerate the test are still of doubtful value.

A chemical reactivity test which can be completed in three working days has been developed by the Bureau of Reclamation; and the Microscopic examination of aggregates and concrete is being tried.

A method of alternate cycles of heating-drying-cooling-soaking of test prisms now under investigation in some laboratories has found limited acceptance.

The report includes a brief discussion of theories of the subject.

Notes on an American Railway Engineering Association committee report, "Methods for Improving the Quality of Concrete and Mortars" published in the ASSOCIATION BULLETIN *for December, 1953.*

Increased slab rigidity due to end restraint

"Analysis of many three-dimensional monolithic structures [structures subjected to forces acting in more than one plane] requires information as to the torsional rigidity of the elements of which they are constructed. Because of rigid connections at the ends, warping of the members is restricted and bending stresses are induced with the torsion. For this reason, the elementary theory of torsion cannot be applied.

"In this paper the effect of end restraint on the torsional rigidity of rectangular slabs has been analyzed. The magnitude of the stiffening effect is found to vary with the length-width ratio of the slab. For square slabs,

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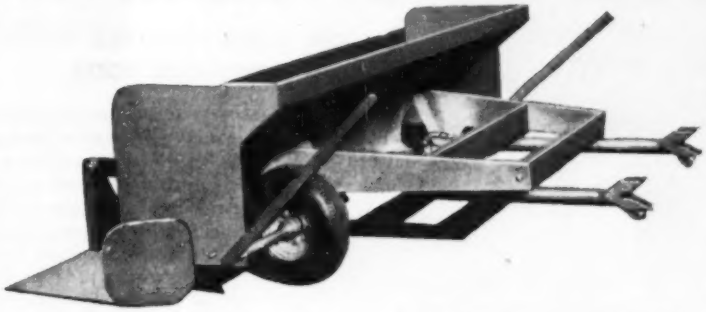

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A track cable was stretched across the river and hung so it closely paralleled the slope of the river bed. A Sauerman Crescent Scraper was attached to a single-wheel carrier which rode the track cable. Digging depth was almost automatic, since the scraper could dig no further than the length of the cable which attached it to the carrier. The track cable also served to keep the scraper working in a straight line.

The ¾-cu. yd. Crescent was powered by a two-drum hoist. Maximum span was 700 feet. One man handled the entire trenching operation. A second man was used occasionally to check the depth of the cut. Material pulled in by the scraper was removed by a small clamshell.

For more information and some new ideas, write for Field Report 219, Scrapers with Boom Machines, Field Report 209, Scrapers with Tractors and Catalog J.

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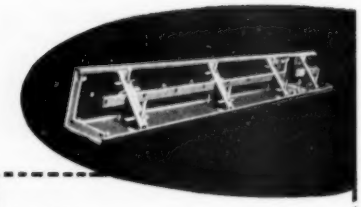

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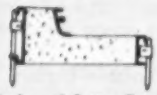

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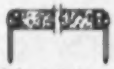

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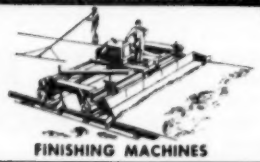

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end fixity increases the rigidity by 80 per cent. Even for slabs with length-width ratios of 6, the rigidity is increased by 8%. Experimental data are also presented, showing good agreement with the analytical results."

Synopsis of a paper, "Torsional Rigidity of Rectangular Slabs," by Kurt H. Gerstle and Ray W. Clough in the JOURNAL OF THE AMERICAN CONCRETE INSTITUTE, *November, 1953.*

Ariel maps for smaller survey jobs

Opportunities for the economic use of aerial maps in locating minor or relatively short stretches of highway are commoner than often realized. Foremost factor is the availability of existing photography. Considering all sources, there is a surprising amount of it. Also, it can sometimes be combined advantageously with other maps, such as the tactical maps of the U. S. Army. Special mapping flights, now commonplace on major work, may or may not be economical for the small job or for parts of it. A comparative estimate with the cost of ground surveys usually will tell.

Texas Highway District No. 21 has drawn on all sources in preparing location maps for 105 miles of line on three separate projects in sparsely settled areas, and has used photography on many other projects varying from a short land service road to major 4-lane development. Preliminary studies and estimates for construction programs have been especially facilitated.

Working materials have come from the State Highway headquarters in Austin, the International Boundary and Water Commission, U. S. Department of Agriculture (AAA), and the Army. Though the scales of these maps vary, it is generally possible to carry out a job without special enlargements or reductions. Standard enlargements of the AAA maps at a 400 feet to one inch scale (1:4800) are commonly used in thickly settled or irrigated sections, while the cheaper contact prints at 1:20,000 scale are sufficient where population is small and development limited. Since scale variations seldom exceed one per cent, no difficulty is experienced in matching the prints into practical working mosaics. Topography is studied by stereoscope, and inconspicuous control points are often located by the same means. Accuracy has been sufficient for needs in all cases.

In general the Army maps (1:62,500) are used as an aid in selecting and projecting a tentative location on the mosaic. This location is then transferred to the stereo maps (same scale as the mosaics) and studied for changes and improvements. Transference of paper location to ground is then made directly from the maps by scaling and measurement, the stereoscope being used in the field where necessary.

"Opening" of the line by bulldozer will come as a novelty to old-time surveyors. As carried out by District 21 in areas of brush and small trees, its cost was about the same as for a 3-ft. line cut by hand, with the tremendous advantage of providing for immediate passage of an auto or truck. Transit operation from a truck-mounted tower was a major feature in speed and economy.

As to cost of prints in this district, "The price of photographs from existing photography is quite cheap. Present prices are, contact prints, 65 cents each in lots of less than 100 and 50 cents in lots of over 100. Enlargements on scale 1 inch equals 400 feet are priced at $5. 10 each in lots of 1 to 5; $3.80 each in lots of 6 to 100; and $3.20 each in lots of over 100. Enlargements at other scales are priced proportionately. County index photos of available counties are priced at $1.10 each."

From a paper by W. J. Apperson and Terry A. Baker in TEXAS HIGHWAYS, *December, 1953.*

OUR FIRST NEED: Better Adminstrative Laws

By Louis R. Morony
Director, Laws Division
Automotive Safety Foundation, Washington, D. C.

SINCE the war it has become increasingly clear that highway laws have not been keeping pace with technological advances and present-day concepts of highway engineering and management. In State after State, highway departments have been confronted with legal roadblocks—not only in projecting long-range programs, but in trying to reorganize to perform routine tasks more efficiently.

With the single exception of North Dakota, no real attempt has as yet been made by any State to evaluate highway law in terms of its over-all effectiveness as a legal instrument under which officials, at all levels of jurisdiction, can carry forward an integrated road program to meet present and future needs.

In 1952, the North Dakota Legislative Research Committee was conducting a comprehensive highway needs study, along with a companion fiscal survey. In the process, it became apparent that the State's highway troubles went much beyond physical deficiencies—that many of the difficulties stemmed from the underlying laws. It was realized that an overhaul of the highway code was imperative, particularly with respect to fixing of authority and defining of responsibilities.

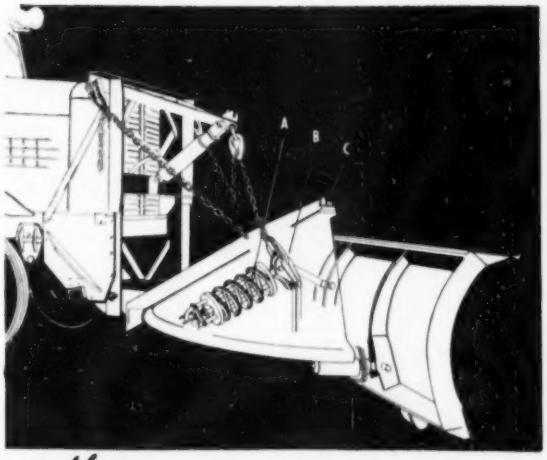
Full Legal Review

The Legislative Research Committee, therefore, requested the Automotive Safety Foundation, which already was providing direction for the engineering study, to undertake a full-scale legal review. The Foundation's Laws Division was in charge of this pioneering project in the field of highway law.

In addition to the North Dakota statutes, the study reviewed in detail the state constitution, pertinent court decisions and attorney-general's opinions, as well as many statutes of other states. In the course of the work, the legal staff held frequent consultations with State Highway Commissioner S. W. Thompson and members of the highway department, including district engineers and other specialists.

When the study report was completed, both the Legislative Research Committee and the highway department fully accepted the findings and recommendations. The latter were then translated into bills, which the State legislature enacted almost in their entirety in 1953. The result was a geenral modernization of the North Dakota highway statutes.

Meanwhile, the Executive Committee of the American Association of State Highway Officials had, by a 1951 resolution, requested the Highway Research Board to sponsor a comprehensive study of the highway laws of all the 48 states. The action of the Executive Committee was taken in recognition of the fact that at present the States have no acceptable yardsticks for evaluating their laws; nor is there a body of established principles to guide lawyears and law-makers in translating modern engineering thinking into sound legislation.



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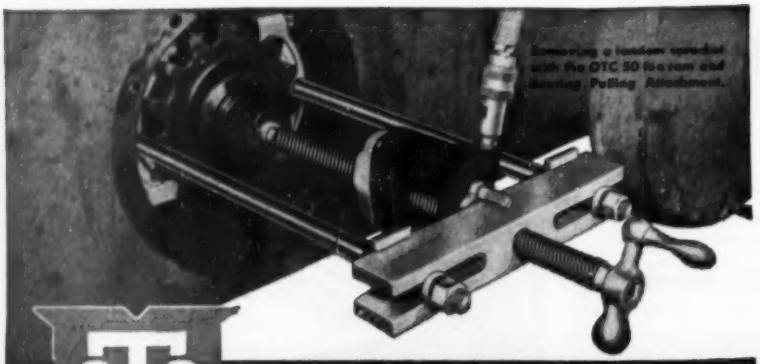

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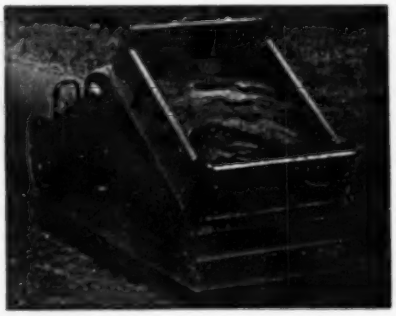

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Nation-Wide Study

Having noted the practical results of the North Dakota study and the wide-spread interest which it engendered, the Highway Research Board decided in the winter of 1952 that the time was opportune to launch the vast project urged by AASHO. To initiate the work, a small working committee, headed by the author, was organized under the Board's Department of Economics, Finance and Administration. It's objectives are:

(1) To assemble state constitutions and statutes, and analyze them as they relate to all highway functions, such as system classification, highway design, construction, maintenance, etc.

(2) With the background of fact so derived, to isolate important principles so that authorities throughout the country may later—by extensive review and discussion—help to determine which are basic for adequate highway laws.

The first progress report of the Committee on Highway Laws was made at the AASHO annual meeting in Pittsburgh before the Legal Affairs Committee. It comprised two phases of the many-sided study—State constitutions and system classification.

Eventually the survey will also include the legal aspects of highway administration, federal aid, intergovernmental relationships, financing, location and design, programming, land acquisition, access control, roadside regulation, contracts, construction, bridges, maintenance, budgeting, accounting and purchasing, traffic engineering, toll facilities, parking and numerous other elements bearing on the development and operation of the road plant. The entire job may require possibly five years.

Big Job Ahead

It is expected that the original small committee will soon be enlarged, bringing in State, county and municipal engineers, administrators, law officers and judges, legislators, city and county officials, planners, economists, and leaders of business, industry and agriculture. The best minds of the country will be invited to participate and contribute their ideas to the final product.

When the staff has completed the monumental task of collecting, analyzing and recording all the essential facts about existing highway laws, the next step will be to sift the accumulated data. The factual material will be aired and discussed on the widest possible scale. For this purpose, it is expected that regional forums will be set up with the aid of the expanded committee. From this unlimited review, there should ultimately emerge a cross-section of the best thinking and experience as to what constitutes the rock-bottom fundamentals in every functional phase of highway law.

Prestressed beam

(Continued on page 104)

the beam. The ultimate moment would then be

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According to design criteria

$8{,}603{,}000 > 2.25\ (M_D + M_L)$ or $1.0\ M_D + 3.5M_L$

$> 2.25\ (1{,}432{,}000 + 0.63 \times 2{,}268{,}000)$ or $1{,}432{,}000 + 3.5 \times 0.63 \times 2{,}268{,}000$

$> 2.25\ (1{,}432{,}000 + 1{,}429{,}000)$ or $1{,}432{,}000 + 5{,}001{,}000$

$> 6{,}437{,}000$ or $6{,}433{,}000$.... O.K.

The live load moment of 2,268,000 in.-lb. resulted from a calculation of increasing the tabular live load from 0.25 of the lane load to 0.27 of the tabular lane load. At ultimate strength the live load is assumed to be carried by the entire width of the bridge and in the particular structure being considered the total width of the bridge is considerably greater than 8 ft. per lane. Hence an assumed 63% of the beam live load bending moment was taken.

Beam Design

With the calculated data available and the cross-section as well as the location of the steel strands established, all that remains is to put some longitudinal shear bars in the slab along with cross tie rods, and to establish diaphragms at the ends and the third points. The diaphragms and beam will be cored in order to install cross-tie prestressing strands. After the transverse strands are anchored the holes may or may not be grouted. When the beams are all tied together and the hub-rail in place the bituminous surface course may be applied. Don't fail to protect and waterproof all end and transverse anchors.

Notations and Design Criteria

The following notations were used in this discussion:

- A = Cross sectional area of piece under consideration
- A_c = Cross sectional area of concrete (steel area not deducted)
- a' = Cross sectional area of concrete above point under consideration
- y_t = Distance from top of piece under consideration to its centroid
- $\overline{y}$ = Distance from top of beam to its center of gravity
- y' = Distance from neutral axis to center of gravity of area a'.
- I_o = Moment of inertia of piece
- I = Moment of interia of beam cross section
- b' = Width of web of beam
- Z_t = Section modulus of top fiber, referred to c.g.c.
- Z_b = Section modulus of bottom fiber, referred to c.g.c.

Concrete Cutter Cuts to 6½-in. Depths

This Wisconsin-powered Felker unit, made by Felker Mfg. Co., Torrance, Calif., cuts trenches in concrete and curbs, removes core samples, scores and grooves concrete, tile, granite and marble; cuts off and slits terra-cotta pipe, transit pipes and many other jobs in the same general category, according to the manufacturer.

The Model TF 2-cylinder Wisconsin Heavy-Duty Air-Cooled Engine has the lugging power and stamina required for rugged service of this kind. It pays to specify "Wisconsin Power" for your equipment, regardless of the service application, because these rough-and-ready engines fit the job and the machine, without power waste. *All* Wisconsin Air-Cooled Engines run on tapered roller bearings at BOTH ends of the crankshaft — a typical heavy-duty feature. Available in a complete power range from 3 to 36 hp., in 4-cycle single cylinder, 2- and 4-cylinder models.

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JAW CRUSHERS · IMPACT BREAKERS
PULVERIZERS · CONVEYORS · LOADERS

CRUSHER CO., Inc. GALION OHIO·U·S·A

w_G = Dead load per unit length when the prestress is being established (in this case, the self weight of the beam).

w_g = Additional (superimposed) dead load per unit length applied when the prestress is being established (deck, floor, roadway, etc.).

w_D = Total dead load per unit $= w_g + w_s$

M_D = Bending moment due to w_D

M_L = Bending moment due to w_L

l = Length of span between supports

f'_c = Cylinder strength at 28 days

f_{cp} = Allowable or permissible compressive stress

f_c = Compressive stress generally

f^t_D = Stress in top fiber due to dead load w_D

f^b_D = Stress in bottom fiber due to dead load w_D

k = Kip = 1000 lb.

f^t_L = Stress in top fiber due to live load (plus impact)

f^b_L = Stress in bottom fiber due to live load (plus impact)

F = Total prestress load in pounds

F_u = Ultimate prestress load in pounds

e = Eccentricity of center of gravity with regard to center of gravity of concrete

c.g.s. = Center of gravity of steel

c.g.c. = Center of gravity of concrete

f^t_F = Stress in top fiber due to effective (final) prestressing only

f^b_F = Stress in bottom fiber due to effective (final) prestressing only

v = Shearing stress, in this case horizontal shear

V = Total shear in beam due to dead and live loads minus shear carried by strands

f_t = Tension stress generally. In this article it is diagonal tension

f'_{th} = Horizontal stress at point under consideration

d = Effective depth of section

From 15 to 17 inches steam space above low water level, insuring ample steam reserve for sudden excessive demand.

Used by many Road Contractors with their asphalt plant installations.

May be fired with coal, wood, gas or oil.

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Design Criteria for Prestressed Concrete Bridges (Pretensioning)

The following design criteria were selected for a particular bridge project:

Concrete—The concrete shall have a minimum compressive strength (f'_c) of 5,000 psi. The contractor shall satisfy the engineer by tests of the mix to be used that the concrete strength at time of transfer of prestress is adequate to insure bond between the steel and concrete.

Allowable Unit Stresses—Before allowance for creep or shrinkage
Compression in extreme fiber $= 0.5f'_c$
Tension in extreme top fiber $= 0.04\ f'_c$

For design loads after allowance for creep and shrinkage
Compression in extreme fiber $= 0.4\ f'_c$
Tension in extreme bottom fiber $= 0$
Tension in extreme top fiber at supports where dead load moment is zero $= .04\ f'_c$

Nominal reinforcing bars shall be provided in the top flange to compensate for this tension.

Cracking Load.—Permissible tensile stress in bottom fiber $= 0.15\ f'_c$.

Cracking load should be at least equal to $1.0\ f^b_D + 2\ f^b_L$ (Overload).

Ultimate Load.—The ultimate load should be not less than $2.25\ (f^b_D + f^b_L)$ or $1.0\ f^b_L + 3.5\ f^b_L$, whichever is the greater.

When computing the cracking moments and ultimate moment, the live load may be considered as equally distributed over all roadway girders. Impact shall be included in the live load factors.

Universal Atlas Appointments: J. T. Maher, heretofore assistant sales manager of New York territory, has been appointed assistant to vice president, sales, eastern and southern region of Universal Atlas Cement Co., New York, N. Y. Bredon J. Whittaker has been appointed sales manager of the Boston territory.

Maximum Joint Filling

WITH

Servicised

SELF-EXPANDING

CORK

▶ Recovers 50% Beyond Original Thickness After Compression
▶ Fully Compressible
▶ Non-extruding, Resilient

Ideal for large concrete structures or masses where substantial initial contraction is anticipated before any considerable amount of expansion takes place. 50% expansion beyond original thickness after compression keeps joint space filled, regardless of concrete movement. Made in ½" to 1" thicknesses; 2" to 12" (Standard) widths; also made in 24" and 36" widths on special order.

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SOIL AIRE

ROLLPAC

Ruggedly built for heavy-duty service

$895.00

A Standout Popular-Priced One Ton Roller. Send for Catalog.

SOILAIRE INDUSTRIES

Minneapolis 3, Minnesota

Sold by over 75 distributors in United States and Canada

With the Manufacturers and Distributors

Clark Equipment Appoints 4 New Dealers: Four new dealers have been appointed by the Construction Machinery Division, Clark Equipment Co., Buchanan, Mich. to handle the earth-moving equipment formerly manufactured by Michigan Power Shovel Co., which was acquired by Clark Equipment Co. last May. The new dealers and their territories are Berry Brothers Machinery Co., Dallas, Tex., for the San Antonio area; Furnival Machinery Co., Harrisburg, Pa., for the Harrisburg area; George P. Williams Co., Cleveland, O., for the Cleveland and Akron trading areas; and Henry H. Meyer Co., Inc., Baltimore, Md. for the Baltimore area.

Aeroil Appointments: Charles Klevles has been appointed Pacific Coast manager for Aeroil Products Co., Inc., South Hackensack, N. J. He has been manager of the Seattle, Wash. branch for a number of years and will make the Seattle office his headquarters. Bill Wonder has been appointed sales representative in the middle west with headquarters in Kansas City, Mo.

Fair Appointed District Sales Representative: Elton T. Fair has been appointed district sales representative for Pioneer Engineering Works, Inc., Minneapolis, Minn. He will represent Pioneer in Wyoming, greater part of Montana, western half of South Dakota and five western counties in North Dakota.

Sinclair Refining Promotes Linder: E. V. Linder, formerly asphalt and road oil salesman for Illinois and Indiana, has been promoted to manager road oil and asphalt sales, Sinclair Refining Co., New York, N. Y. He succeeds the late Burrill Ennis.

Marlow Appoints District Engineer: Roger Vannelli, formerly in charge of the New England territory for Marlow Pumps, Ridgewood, N. J. has been appointed district engineer for Virginia, West Virginia and North Carolina with headquarters in Raleigh, N. C.

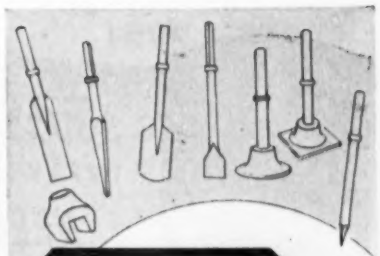
Le Roi Promotions: Hugh M. Little has been named a vice president of Le Roi Co., Milwaukee, Wis., and Norman J. Kimber has been promoted to works manager of Le Roi's Milwaukee Division.

Kostyzak Named Madsen Sales Manager: Alex Kostyzak, since 1946 general sales manager and vice president of Smith-Booth-Usher Co., Los Angeles, Calif., has been appointed sales manager of Madsen Iron Works, Inc., Los Angeles, Calif., and will be in charge of domestic and foreign sales.

New Blaw-Knox Distributor: Shaw Sales & Service Co., Los Angeles, Calif., has been appointed exclusive representative in southern California for Blaw-Knox construction equipment and clamshell buckets and Foote construction equipment.

Blaine S. Smith Retires: Blaine S. Smith retired Dec. 31 as president of Universal Atlas Cement Co., a subsidiary of U. S. Steel Corporation. He is succeeded by Charles B. Baker, executive vice president. Mr. Smith, who has been associated with Universal Atlas for more than 37 years, will continue with the company in a consulting capacity.

Brown Appointed District Manager: John E. Brown has been appointed district manager, north central territory, for St. Paul Hydraulic Hoist, Minneapolis, Minn.



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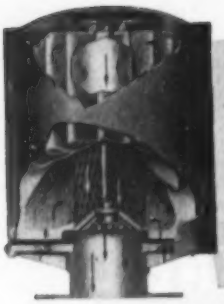

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Only Staynew Intake Filters have the ability to remove air-borne particles without the necessity of viscous filter aids. The *dry-type* filtering medium becomes even more efficient as it accumulates dust. Resistance increases very slowly with use. Staynew filters frequently operate two or more years without attention. When cleaning is indicated, a brush or simple vacuum tool is all you need. There are no oil reservoirs to clean and refill—no oil coatings to renew.

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LONG TRENCHES OR SPOT EXCAVATIONS

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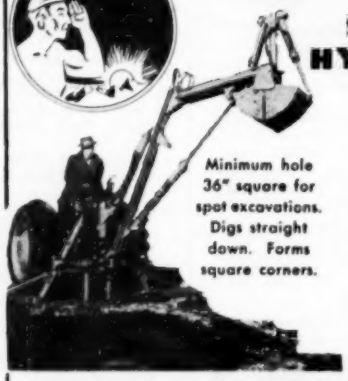
DIGS 11 FEET DEEP!

Owners themselves report satisfactory digging at this depth with a reach of 14 ft. The operating arc is throughout 150° and the loading height is 8 ft. 6 in. Installation or removal from the tractor may be made in less than 20 minutes.

SHAWNEE



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The answer to heavy digging and spot excavations. 4½ tons of pressure is applied to both halves of the clam.

Minimum hole 36" square for spot excavations. Digs straight down. Forms square corners.

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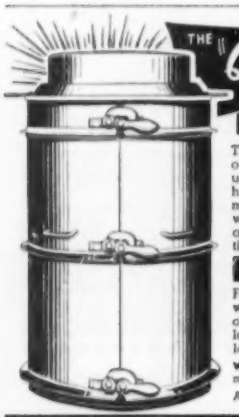
- 24", 30" and 36" with clam buckets
- Adjustable outriggers
- Interchangeable

SHAWNEE MANUFACTURING CO., INC.

1947-G North Topeka, Topeka, Kansas

Harvester Acquires Heil Tractors: International Harvester Co., Chicago, Ill., has announced an agreement with the Heil Co., Milwaukee, Wis., which will enable Harvester to manufacture two-wheel rubber-tired tractors for use in heavy construction work. The arrangement between the two companies is covered by a contract under which Harvester acquires Heil patents covering two-wheel tractors. In addition, Harvester acquires designs and manufacturing data which will materially shorten the time otherwise required by Harvester to engage in the production of the tractors. Under the agreement Heil will supply Harvester with two-wheel tractors for an interim period until Harvester begins the manufacture of tractors, and Heil will also manufacture certain types of scrapers and wagons for Harvester during the period of the agreement, which continues for a number of years. Two models of such tractors are currently being built by Heil. Combined with either scrapers or wagons, they have been marketed as "Heilliners" through Heil's sales organization. They will now be sold through Harvester's industrial power division and a worldwide network of distributors under Harvester's trade name "International."



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QUINN HEAVY DUTY PIPE FORMS

For making pipe by hand methods by either the wet or semi-dry processes. Built to give more years of service—sizes for pipe from 10" up to 120" and larger—tongue and groove or bell end pipe at lowest cost.

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Also manufacturers QUINN CONCRETE PIPE MACHINES

QUINN WIRE & IRON WORKS 1637 - 12th St. Boone, Iowa

Fuller Appointed Baker-Lull Distributor: C. C. Fuller Co., 7913 S. Phillips Ave., Chicago, Ill., has been appointed distributor by Baker-Lull Corp., Minneapolis, Minn. for Baker-Hull self contained materials handling equipment in the Chicago area.

Hannan Appointed Sales Representative: John J. Hannan has been appointed southwestern sales representative for Perfection Steel Body Co., Galion, O., with headquarters in San Antonio, Tex.

Sisalkraft Merges with Manufacturing Division: The Sisalkraft Co., Chicago, Ill., has merged with its manufacturing Division, The American Reenforced Paper Co. The organization will be renamed American Sisalkraft Corporation. Certain key personnel will be moved to its plant headquarters in Attleboro, Mass. Regional sales offices will remain in Chicago, New York and San Francisco.

Tanner Elected Vice President: Robert E. Tanner has been elected vice president and general manager of Carver Pump Co., Muscatine, Ia. He also assumes the post of general sales manager. He formerly was vice-president of the National Can Co.

Aeroil Appointments: Charles Klevies has been appointed Pacific Coast manager for Aeroil Products Co., Inc., South Hackensack, N. J. He has been manager of the Seattle, Wash. branch for a number of years and will make the Seattle office his headquarters. Bill Wonder has been appointed sales representative in the middle west with headquarters in Kansas City, Mo.

Waite to Handle Bucyrus-Erie Excavators: J. P. Waite, Inc., 3304 West Pierce St., Milwaukee, Wis. now offers sales and service on Bucyrus-Erie ⅜ to 4 yd. excavators and cranes in Wisconsin and upper Michigan. The Waite firm has been associated with Bucyrus-Erie since 1948 as distributor for their truck-mounted all-hydraulic Hydrocrane and Hydrohoe which it will continue to carry.

Sinclair Refining Prmootes Linder: E. V. Linder, formerly asphalt and road oil salesman for Illinois and Indiana, has been promoted to manager road oil and asphalt sales, Sinclair Refining Co., New York, N. Y. He succeeds the late Burrill Ennis.

FOR SALE

Blaw-Knox XC Finisher CB 2398
Barber-Greene Undertrack Conveyor
Fairfield Undertrack Conveyor
2 International ID 6 Tractors
Model M Farmall Tractor
Model H Farmall Tractor
Buffalo-Springfield 3 Wheel 10 Ton Roller
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Above equipment located in South Carolina

BALLENGER PAVING CO.
P. O. BOX 927
GREENVILLE, SOUTH CAROLINA

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1—1952 Model standard steel road oil distributor. Capacity 1500 gallon. Insulated tank, full circulating spray bars. Mounted on 1952 Dodge truck, model B 3YA172.
1—Littleford road oil distributor. Capacity 1050 gallon. Insulated tank, full circulating spray bars. Mounted on 1945 International truck, model K-8.
1—Brackel road oil distributor. Capacity 1250 gallon. Insulated tank, full circulating spray bars. Mounted on 1949 GMC truck.
2—Etnyre road oil distributors. Capacity 1350 gallon. Insulated tank, full circulating spray bars. Mounted on 1946 Brockway trucks. Model 146-W.
1—Etnyre road oil distributor. Capacity 1800 gallon. Insulated tank, full circulating spray bars. Mounted on 1947 Brockway truck.
1—Etnyre road oil distributor. Capacity 2200 gallon. Insulated tank, full circulating spray bars. Mounted on High Way Trailer.
1—Littleford tank car heater. 1952 model. Mounted on 1945 Dodge 1½ ton truck.
3—Cleaver-Brooks tank car heaters. Mounted on Dodge 1½ ton trucks. 1947 model.
1—Hetherington & Berner, Inc. Moto-Patcher, 1952 model.

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FOR SALE

20 ton Lorain Moto-Crane MC414, serial #15289, 1947 model. Equipped with lagging for crane, clam, and dragine. 80' of boom and 30' jib. Includes Fairlead, tagline, and crane hook. Has a precision boom lowering device. Superstructure power is a Waukesha MZA and carrier power is a Waukesha SRKR. Major overhaul in Spring of 1953. Excellent condition. Location, Hudson, Ohio.

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1, Dorr Classifier capable of dewatering 100 or more tons of sand per hour. Give type and size of machine and price loaded on car.

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1, 30" Belt conveyor 1000 to 2000 ft. long complete, or parts for the same.

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Shovel Attachments
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Reasonable

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V Type for FWD, Model 662, mfgd. by Good Roads.
V Type for Ford Truck.
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120 in.	8.50
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Final closing date is the Fifteenth of the preceding month. Magazine is issued 1st of publication month. If proof desired, copy must be received 5 days preceding closing date.

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Concrete Outfit

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Barber-Greene model 358 24" belt type hopper car unloader Wisconsin engine with clutch. Trailer mounted. New condition.
14-S Jaeger cement mixer on 4-wheel pneumatics, skip, water tank, batchmenter.
Whiteman model B 36" cement floor finisher. Briggs & Stratton engine. 6" x 18" blades.
Dart 9000 rpm electric concrete vibrator. 2¼x18" head.
Model 887 Gardner Denver paving breaker. 1⅛" chuck.
Model T23 Gardner Denver tamper.
Model 87 8" skilsaw.
Miller Falls electric bush hammer.
I-R & CP model 60 and 80 air riveters.
Thor ½" tapered chuck air drill.
Two 2-yard dumpcretes.

MAKE OFFER

Faris-Moritz Equipment Co.
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Phone: Pearl 2489

FOR SALE

Dozer (only) La Plant Choate Hydraulic, angle, for D-7, front pump, complete $800.

One Cat. D-3400 Diesel Power unit, 40 H.P. radiator and clutch, elect. starter, $850.

RICE PETROLEUM CO., WAUPACA, WIS.

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Cat No. 70 has been used very little $4,750.00

LeTourneau LP in A-1 mechanical condition $3,250.00

LaPlant-Choate C114 (12 yd.) with practically new tires..... $4,000.00

LeTourneau LS has good tires and is in good operating condition. $2,000.00

Pictures and detailed information furnished on request.

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MONTGOMERY, ALABAMA
P.O. Box 1591 Telephone 2-0306

FOR SALE

35 Ton Davenport gas locomotive, 4 wheels, std. gauge, 8 cyl. LeRoi engine, Westinghouse air brakes, hand brake, heater in cab, MCB couplers, all reconditioned, held as standby used little, very good condition. Priced to sell.

17 Ton Whitcomb gas locomotive, 4 wheels, std. ga., 3 ton Plymouth gas 36" ga.

3 8 ton Whitcomb trolley tye elec. 250 volts, with reels, 36" ga.

50 - Lorain diesel shovel, new 1951, 1¼ yd. dipper on crawlers $22,000.00

37B & 2 - 38B Bucyrus Erie shovels, cranes, draglines.

¾ yd. Unit diesel shovel, age 5 yrs., used on stock piles $5,500.00

5 - Gaso. Elec. light plants, 2½ to 5 KW, 110 V., reconditioned.

12 - 1" & 1⅛" drill presses, some new, $90.00 and $125.00 each.

TL25 Lorain ¾ yd. diesel crane on crawlers, 35' boom, new 1950.

McCartney Machinery Co.
Box 3105, Youngstown 12, Ohio

WANTED

125 Ton Railroad Track Scale

4' or 4½' Symons Cone Crusher

Approximately 200' 24 inch Belt Conveyor

Write Box 1128, Roads & Streets
22 W. Maple St., Chicago 10, Ill.

1953

CRANE - DRAGLINE PULLSHOVEL - BARGAIN

Practically new Wayne Model 66 Crawler, mounted Crane, 8-ton capacity. Also equipped with Trench Hoe, half-yard capacity, with 24-in. crawlers, Waukesha engine, power boom hoist, 2-speed transmission. Machine new July 1953. Used approximately two months. Carries some warranty as new machine.

Hunter Tractor & Machinery Co.
327 So. 16th St. - Milwaukee 3, Wis.
Phone - Orchard 2-6580

FOR SALE

1 - B.E. 10-B shovel, 1941 model, cond. exceptional. Price $4,900.00

1 - ¾ yd. B.E. crane, serial 17396. Price $4,500.00

1 - D-7 Cat. Dozer - serial #3T4202. Cond. excellent. Price $6,900.00

1 - B.E. 22-B dragshovel - brand new.

1 - B.E. 15-B dragshovel - ser. #101275.

C. L. Herman
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89 foot Boom
Steam Operated
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4 In. Steam Pump

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NEW 4 comp. bin. One 117 ton cement. Three 27 ton Aggregate compartments, (can furnish elevator and w/Batcher)	5,120.00

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**Every tire in perfect condition with 50 to 90% original tread.*

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Caterpillar model 112 motor grader, serial #IU-223. In very good condition. Price, f.o.b. Springfield, Illinois $8,000

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IH TD-18 tractor, serial #TDR-16199, w/LaTourneau straight cable dozer. Rebuilt completely-final drives, transmission, engine, clutch, rollers, etc. F.o.b. Rock Island, Illinois ..... **Only $7,500.00**

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2 Heil cable dozers with Heil Model S-2 rear double drum power control units for IH TD-18 tractors. In good condition. Price each F.o.b. Westervelt, Illinois **$1,500.00**

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Ford tractor w/Wagner end loader and attachable scoop and backfill blade. In perfect condition. F.o.b. Rock Island, Illinois ..... **Only $1,500.00**

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Adams model 50 motor grader. F.o.b. Rock Island, Illinois **$1,500.00**

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Jaeger 4½ HM truck mixer. In good condition. F.o.b. Morton, Illinois **$2,500.00**

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Riddell pull-type rotary scraper. F.o.b. Morton, Illinois **$65.00**

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15 HP upright flueless high pressure boiler on trailer. F.o.b. Morton, Illinois **$395.00**

IH U-9 power unit used as demonstrator. F.o.b. Morton, Illinois **$600.00**

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Insley K-12, 1945, Internat. gas engine, backhoe & dragline booms and buckets 4,000.00

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Also 1948 GMC 350 dump and 1950 GMC 450 dump.

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Used Model 826 Osgood Excavating Machine equipped with 2 yd. backhoe and GM Diesel Engine. Machine new - May 1953 and is in perfect condition.

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Bucyrus-Erie 51-B Dragline
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DEPENDABLE USED MACHINES

Bay City 1¼ yd. shovel; rebuilt; new motor
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P&H ½ yd. crane; rebuilt; cheap
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Simplicity 2x6 vibrating screen

TRACTOR & EQUIPMENT CO.

10032 Southwest Highway **Oak Lawn, Illinois**

Manufacturers' Literature

Foundation Borer for Concrete Footings

A new bulletin, Form F-173, on the Gar Wood foundation borer has been announced by the Findlay Division of Gar Wood Industries, Inc., Customer Service Department, Wayne, Mich. The foundation borer, an attachment for the Gar Wood 75 Series excavator, is stated to be a machine which has introduced the unreinforced type foundation footing. The bulletin describes the operation of the foundation borer. This machine, which has a revolving cylindrical bucket, bores a round hole of 44, 36 or 25 in. in diameter. The bucket can be raised and swung away from the hole to empty. Vanes on the side of the bucket can be opened at any step to bell out the hole. Because the foundation borer makes a clean, round hole without disturbing the surrounding ground, it is stated concrete for the footing can be chuted into the hole immediately after excavation.

Lorain "50" Series Shovels and Cranes

A 24-page, two-color bulletin, published by The Thew Shovel Co., Lorain, O., covers the crawler-mounted power shovels and cranes in the 1 yd. Lorain "50" Series. Design and construction illustrations highlight the booklet. It explains very clearly the leading features of the "50" line which include direct power from the engine through a center drive pinion to independently clutch-controlled hoist and swing-travel shafts, air controls for hoist, crowd, retract and drag actions, the hydraulic coupling which prevents stalling and shock in shovel operations, and the precision boom lowering device and precision power load lowering for crane work. There also are operating views of the Lorain "50" cranes, shovels, hoes, clamshells and draglines and sections devoted to each of these five interchangeable front ends with full explanations of their accessory equipment.

Cutting Snow Removal Costs

"How to Cut Snow Removal Costs up to 50%" is the title of a new descriptive catalog recently issued by National Lift Company, Ypsilanti, Mich., covering Snowlift hydraulic snow plow controls. The new catalog illustrates how the more than 10,000 Snowlift users have averaged savings of $100 per plow, per season in their snow removal programs. National Lift's fan-belt driven hydra-clutch pump provides hydraulic power for the instant responding plow controls. Pump draws only 3 h.p. about half that to operate the generator. Leaves power takeoff opening free for other uses, stops battery drain. Copies of the new catalog, Form NL-116, are available free from National Lift Company, Customer Service Department, Wayne, Mich.

Motor Graders

A new folder (Form 30822) Caterpillar Motor Graders, depicts the three sizes of motor graders manufactured by Caterpillar Tractor Co., Peoria 8, Ill. The highly illustrated folder shows Caterpillar motor graders performing the duties of contour terracing, ditching and casting, bulldozing and blading for grade construction, spreading windrows of oil and aggregate, removing snow from airfields and bank-cutting. The folder is separated under the titles of "Where They Are Proved," "How They Are Built," "What They Will Do" and "Who Is Responsible."

Full Line Cleveland Trenchers Described

A new bulletin describing the complete line of Cleveland trenching equipment has been published by The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, O. Inside spread of the 4-page bulletin permits a simple, quick comparison of the digging capacity and specifications of the Cleveland Trencher Models 92, 95, 110 and 140, the standard machines trenching from 10 in. to 30 in. wide and up to 5½ ft. deep. Text briefly describes specific advantages, typical job applications, and special Cleveland construction features of each model. The Cleveland Model 80 backfiller, side crane, tamper is also treated on the spread. Action photographs illustrate the Clevelands at work on different trenching jobs. Page 4 features Cleveland's pipeline team, the Model 320 trencher and the Model 190 backfiller.

Excavating and Material Handling Machinery

A new condensed catalog, Bulletin No. 5324, presenting pictorially its line of excavating and materials handling machinery, with condensed specifications, is available from Osgood-General, P. O. Box 515, Marion, O. Sizes of machines range from ⅛ to 3 cu. yds., and from 10 to 63 tons lifting capacity. Choice of mountings and front end attachments is illustrated, as well as special equipment for various types of operation. Included are the versatile, one-man operated mobilcranes, designed for log-loading, dock-side, industrial-yard, and transportation materials-handling.

Manganese Steel Castings

A new general catalog describing the complete line of castings made of "the toughest steel known" has been released by American Manganese Steel Division, 389 East 14th St., Chicago Heights, Ill. Typical castings are shown in over 100 photographs with applications listed. There is also a complete discussion of the impact and abrasion resistant characterstics of Amsco 13% manganese steel under each product category. Detailed information on power shovel dippers, teeth, chain, gears, sheaves, crusher parts, dredge and materials handling pumps, etc., is included.

Cold-Poured Joint Filler

An informative data sheet, issued by The Flintkote Co., Industrial Products Division, 30 Rockefeller Plaza, New York, New York, describes its cold-poured joint sealer for concrete pavements, called "Flintkote CPS." This cold-poured type is a rubber asphalt blended compound which is pumped from a drum by air pressure and extruded into the joints or cracks through a narrow mouth nozzle. Many engineers and contractors have shown preference for a cold-poured sealer. Flintkote CPS was developed for their requirements.

Belt Conveyor Idlers

Useful information on its belt conveyor idlers is given in a new 6-page bulletin issued by Atlas Conveyor Co., Clintonville, Wis. Covered are belt widths 12 in. through 42 in.; fixed, self aligning and impact styles; troughing and return type; and plain, roller or ball bearings. Sectional illustrations of Timken bearing and plain bearing assemblies are included as well as illustrations of various types of idlers and tables of dimensions.

Spreader for Ice Control and Seal Coating

The Century hydraulic spread-all for salt, calcium chloride, sand, cinders and granular abrasives is illustrated and described in a 4-page circular issued by Century Engineering Co., Waukasha, Wis. Various important features of the spreader are pictured and described. The spreader is hydraulically operated from the power take off of the truck engine. The operation is completely automatic push-buttoned controlled from truck cab by the driver. Thus only one man (the driver) is required for operation of the spreader. The width of spread is 10 in. to four express lanes, and it is stated the spreader will spread as little as 100 lb. of salt per mile up to any volume required.

Unit's New Engineering Developments

Unit's new engineering developments are covered in a new 8-page bulletin published by Unit Crane & Shovel Corp., Milwaukee 14, Wis. Featured are the 1014 truck crane, the 1520 heavy duty carrier, new design electric power trip, latest "Alumetalic" clutches, gooseneck trench hoe boom, telescopic type boom stop and Unit with torque drive. Illustrations and descriptions of these developments are included.

Rock Drills

A new fact-packed bulletin (87-X) on the Joy line of "Silver Streak" rock drills has been announced by Joy Manufacturing Co., Oliver Bldg., Pittsburgh 22, Pa. Economy and operating features are covered in eight pages of detailed description, specifications, and photographs. Exclusive Joy developments, such as cadmium plating and the patented dual valve are described. Joy hand-held drills are built in four sizes. In addition to this main line, the bulletin covers Joy plug drill, spaders, and other related tools.

Flexible Tubing Data Book

The scientific application of flexible tubing for air, oil, steam, gases, and volatiles is explained in an 8-page illustrated data book, published by Pennsylvania Flexible Metallic Tubing Co., 72nd St. and Powers Lane, Philadelphia 42, Pa. The various Penflex products are catalogued and pictured. They are also shown in application photographs. Complete engineering data on all Penflex tubing and couplings are given.

Lift Truck

A new 8-page illustrated catalog on the Hyster YT-40 lift truck is available from Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore. The YT-40 is a 4000-lb. capacity model featuring trunnion-mounted steering and pneumatic tires. It is an all-purpose, inside-outside truck. Complete description, specifications and actual on-the-job photos are included in the catalog.

Data on Light-Weight Pipe

A new bulletin No. 507, issued by Naylor Pipe Co., 1230 East 92nd St., Chicago 19, Ill., shows typical applications of its light-weight lockseam-spiral-weld pipe and fittings. Included are standard specifications on pipe from 4 to 30 in. in diameter, together with data on fabricated fittings, flanges, and connections to meet all pipe line requirements.

Schield Bantam C-35 Unit

Schield Bantam Co., of Waverly, Iowa, has issued an attractive folder showing details of its new Model C-35, 5-ton, ¾ cu. yd. crawler crane excavator. Specifications are a major feature.

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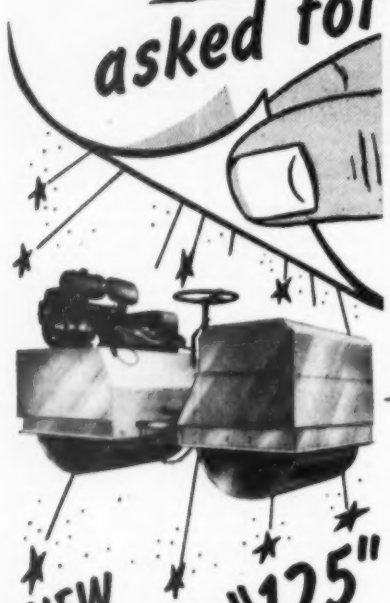

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INDEX TO ADVERTISERS

A. & A. Contracting Trucking Co. 127
Adams Mfg. Co., J. D. 55
*Allis-Chalmers 10, 38-39
*American Steel & Wire Division (United States Steel Corporation) 59
Anderson Equipment Co. 124, 126, 128
*Armco Drainage & Metal Products, Inc. 30
Armstrong Products Company 64
*Austin-Western Company 42-43

Bairstow Co., H. 124
*Baldwin-Lima-Hamilton Corp. 32-33
Ballanger Paving Co. 121
*Barber-Greene Company 72-73
Baumgardner, Lewis A. 121
Beemsterboer Slag & Ballast Corporation 125
Bement Equip. Co., H. D. 121
Berger Co., The J. W. 125
Berkwit & Co., J. C. 125, 127
Bethlehem Steel Co. 3
*Bicknell Manufacturing Company 119
Blaw-Knox Company 114
Bridgewater Township 121
Buhl Machine Wks. 64
Burch Manufacturing Company, Inc. 116
Burford-Toothaker Tractor Co. 122
*Butler Bin Company 24

Caterpillar Tractor Co. 7, 44, 82, Third Cover
Chevrolet Motor Division (General Motors Corp.) 13
Chrysler Corporation (Industrial Engine Division) 31
Chrysler Corporation (Dodge Division) 40
Clermont Brick & Sand Co. 126
Clipper Manufacturing Company 65
Cobb Const. Co., W. L. 127
Coleman and Sons, D. 124
Colorado Fuel & Iron Corp., The (Wickwire Spencer Steel Div.) 35-36
Contractors Machinery Co. 128

Deatherage & Son, Geo. E. 129
Darien Corp. 127
*Detroit Diesel Engine Division (General Motors) 63
Dodge Division (Chrysler Division) 40
Dollinger Corporation 126
*Dorsey Trailers 20
Dow Chemical Co., The 27

Eagle Crusher Co., Inc. 117
Etnyre & Co., E. D. 70
Euclid Division (General Motors Corp.) 29-29
Euclid Division (General Motors Corp.) South Minneapolis 125
Eveready Briksaw Company 34

Falls Construction Co., F. W. 124, 130
Faritz-Moritz Equipment Co. 122
Fayon Construction Co. 126
Ford Motor Company 37
Framingham Sand & Gravel Co., Inc. 127
French, J. C. 121
Frink Sno-Plows, Inc. 115
Forke Brothers 100
Forwell Sand & Gravel Limited 121
Fulton Bag & Cotton Mills 54

Gabb Special Products 132
*Galion Iron Works & Mfg. Co. 68
General Motors Corp. (Chevrolet Motor Div.) 13
General Service, Inc. 128
Goodyear Tire & Rubber Co. 5
Gradall Division of the Warner & Swasey Co. 15
Gray Trucking System, R. E. 124
Gulf Oil Corp. 11

*Harnischfeger Corporation 2nd Cover
Harris Machinery Co. 127
Hawthorne-Michaels Company (Division of Hyman-Michaels Company) 123
Herman, C. L. 122
Hetherington & Berner, Inc. 98
*Hough Co., The Frank G. 19
Huber Manufacturing Co. 25
Hudson Company, A. E. 130
Hunter Tractor & Machinery Co. 122
Hyster Company, The 99

Illinois Road Equipment Co. 128
International Harvester Co. 14

*Jackson Vibrators, Inc. 88
Jaeger Machine Company, The 23
Johnson Company, C. S. 66-67

Keller & Son, L. M. 130
Koehring Company 66-67
Kojac Sales Co. 128
Koppers Company 71
Kwik-Mix Company 66-67

Lane Co., The T. J. 129
Leschen Wire Rope Division (H. K. Porter Company, Inc.) 105
Link-Belt Speeder Corp. 21
*Littleford Bros. 90
Lucey Boiler & Manufacturing Corporation 118

McCarter Iron Works 92
McCartney Machinery Co. 122
McConnaughay, K. E. 74
Mack Trucks 91
*Madsen Iron Works, Inc. 87
Marion Metal Products Co. 111
Maryland State Roads Commission 129
Max Auto Parts 126
Maxey & Leftwich 128
Meyer Co., Inc., Henry H. 130
Meyers Truck Co. 130
Michigan Tractor & Machinery Co. 122, 125
Mid State Contractors Equipment Co. 122
Miller Spreader Co. 113
Mississippi Valley Equipment Co. 124, 128
Mutual Truck Parts Co., Inc. 125

National Business Exchange 127
Neuheisel Lime Works, Inc. 128
Northeastern Road Improvement Co. 124

Onan & Sons Inc., D. W. 112
Overman Mfg. Co., I. J. 97
Owatsona Tool Co. 116
*Owen Bucket Company 58

Park, A. M. 124
Parson Company 66-67
Perfection Steel Body Co. 22
Phillips Co., The Victor L. 125
*Pioneer Engineering Works, Inc. 94-95
Portland Cement Association 12

Quinn Wire & Iron Works 120

Rice Petroleum Co. 122
Roebling's Sons Co., John A. 17, Back Cover

S & L Excavating Co., Inc. 130
Sauerman Bros., Inc. 113
Schramm, Inc. 18
*Servicised Products Corp. 112, 119
Shawnee Manufacturing Co., Inc. 120
Shirley, W. H. 129
Smith & Co., Frederick G. 129
Soilaire Industries 119
Sonoco Products Company 6
Southern Parts Corp. 129
Standard Oil Company (Indiana) 93
Standard Steel Works 96
Substructures Corp. 124
Sundboom, C. R. 125
Swenson Spreader & Mfg. Co. 116
Syntron Company 54

Talman Construction Co. 122
Thew Shovel Co. 41
Timken-Detroit Axle Division (Rockwell Spring & Axle Company) 8-9
*Timken Roller Bearing Co. Front Cover
Tinkler Equipment Co. 129
Tire Sales & Service Co. 129
Tractor & Equipment Co. 130
Troyer, Stanley B. 128

Unit Crane & Shovel Corp. 56
United Southern Contractors Inc. 126
*United States Steel Corporation (American Steel & Wire Division) 59

Vandeventer Auto Sales 126
Verleye, T. E. 126

Warner & Swasey Co. 15
Wellman Company, The S. K. 53
*Wellman Engineering Co., The 109
Wenzel Machinery Rental & Sales Co. 129
West, Jack C. 126
West Virginia Brick Co. 124
White Mfg. Co. 90
White Motor Company, The 16
White Tractor Parts & Equipment Company 126
Wickwire Spencer Steel Div. (Colorado Fuel & Iron Corp. 35-36
Williams Construction Company 126
Wisconsin Motor Corporation 117
Woodstock, City of 128
Woodward Hotel 119
Wylie Manufacturing Co., Inc. 89
Wyoming Valley Equipment Co. 128

Yaeck, Wm. 126

Advertisers with * are represented in the 1954 edition of Gillette's Heavy Construction Prefiled Catalog. Please refer to it for additional information on any of their products.

A USER'S REPORT ON THE DW21

THE USER: A. L. Alley & Son, Faribault, Minnesota.

THE JOB: Relocation of U. S. No. 61 at Red Wing, Minn., where two Cat® DW21 Tractors with No. 21 Scrapers were working with other equipment in wet, sticky conditions on an earthmoving assignment of 300,000 cu. yds. Loading was in wet shale with favorable grade. The going on the ¾-mile haul was good to soft, with 3% adverse grade in the cut. The fill area was soft.

PRODUCTION: Working 9-hour days, the DW21s averaged 900 to 1000 pay yards a day per unit. Loading time with pusher: 1 to 1½ minutes. Running time on the haul: 2¾ minutes. Average cycle time: 8¾ minutes.

Report from the user, Superintendent L. Parker speaking: "With the performance of our DW21s to date, we would say they are the best machines of the rubber-tired class we have ever owned. Those large tires are a big advantage loading the shale, on the haul road and in the soft fill. The rigs are powerful, fast and easy to handle. Their superior performance caused us to buy three additional such machines for another job running south of Red Wing, Minnesota."

There are the facts. Like Mr. Parker, other users report you can't beat this rugged yellow earthmover for big production on long hauls. There are lots of reasons—here are a few: the DW21 is the only two-wheel earthmover designed and built by one manufacturer. Every part is matched for maximum efficiency. Another exclusive: only the DW21 has the rugged, safe triangular hitch which gives wide bearing space and four-point load distribution.

Get the complete picture from your Caterpillar Dealer. He's a source of reliable information and prompt service. Ask him to demonstrate the fast-stepping, big-capacity DW21 on your job!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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